The Harveian Lecture

ON

INDUSTRIAL FATIGUE.

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BY CHARLES S. MYERS, C.B.E., M.D., D.Sc. CAMB., F.R.S.,

DIRECTOR OF THE NATIONAL INSTITUTE OF INDUSTRIAL PSYCHOLOGY.

FOR a member of the same College in Cambridge and of the same hospital in London as William Harvey, it is a special honour to be invited to give this address in his memory. Industrial fatigue must have existed in Harvey's time, but under conditions so widely different from those now obtaining that it could not attract public attention and could not receive such scientific treatment as is possible to-day.

DEFINITION OF INDUSTRIAL FATIGUE.

I shall be expected at the outset to define precisely what is to be understood by industrial fatigue. It will be urged that since the ultimate aim of science is measurement, an exact knowledge of what it is that we are endeavouring to measure must be essential if our procedure is to be scientific. But do we not measure electricity despite our ignorance of its nature? And may we not by statistical methods even measure a common factor affecting a number of different phenomena, without knowing anything whatever of the nature of that factor beyond the fact that it is a common determinant, among others, of those phenomena?

TWO GROUPS OF TESTS.

Assuredly the earliest workers on the subject of industrial fatigue did not concern themselves with its definition or with any careful inquiry into its nature. They set about devising tests which would reveal its presence. Those tests fall into two groups. The first group consist of brief tests of efficiency which were applied to the worker at different times of the day or week, and compared in regard to their results. Thus the average of two or three successive grips of the dynamometer was registered, first, say, in the early morning, then at mid-day, next in the early afternoon, and finally at the end of the day's work, and the difference or lack of difference between the strength of the worker's grip at different hours of the day was held to indicate the presence or absence of industrial fatigue. Other simple tests were employed in the same way—such as a few reaction times, keenness of sight or hearing, the delicacy of discrimination between two near simultaneous touches of the skin or the speed of learning, so as immediately and correctly to reproduce a short series of numbers or letters. And when it became obvious that the worker could simulate fatigue by intentionally doing worse at the tests in the course of their application, tests were introduced which were independent of voluntary control, such as involved a record of the pulse-rate or of the time the skin took to recover its colour after being blanched by momentary pressure.

But another important complicating influence still remained—that of the feelings. The worker might be at one time annoyed or at another relieved by being interrupted in his work in order that these tests might be applied to him; in the early stages of their use he might be alarmed by the apparatus involved, or in later stages he might be bored by them. Such affective variations, together often with the effects of practice, could not fail to obscure the revelation of industrial fatigue, even if—as was tacitly assumed—the tests were competent to reveal its presence and to measure its degree commensurately with their results.

The second group of tests were in themselves tests of fatigability. A relatively lengthy task was imposed—e.g., repeated flexion and extension of a single finger-joint engaged in lifting a weight until the joint could no longer be moved, repeated additions of pairs of numbers, the erasure of a prescribed letter in printed matter, say for an hour, a work curve being obtained, movement by movement, or minute by minute, which was held to indicate the fatigability of the subject, the curves being compared at different times of the working day, week, or season. But here, again, the influence of practice often proved a serious practical difficulty. Moreover, the problem of whether, and if so how far, fatigue at a given occupation was local or general was overlooked. And the degree of correlation between industrial fatigue and the evidence of fatigue revealed by the tests was unknown and apparently unknowable.

Many of these tests, especially after experience sufficient to remove the complicating effects of practice, became so automatic and were carried out so unconsciously as to be incomparable with industrial conditions in which the work was more varied and required the exercise of a certain skill and judgment. The tests were necessarily of a very simple character, measured by quantity rather than by quality of output. In view of all these difficulties, it is hardly surprising that the interpolation of so-called fatigue tests brought discredit on the early attempts to estimate industrial fatigue.

NATURE OF FATIGUE.

Let us, then, turn to a consideration of the nature of industrial fatigue, dealing first with occupations especially involving muscular work. Here, it might be thought, is a field in which the ergograph, recording flexion and extension of an isolated joint within the intact organism, might yield serviceable evidence of the extent of fatigue. Here, too, it might be expected—from the resemblance of ergographic conditions to those of the muscle-nerve preparation—that our knowledge of the physiology of muscle would render valuable help in its application to industrial fatigue. We have reason to believe that the isolated muscle tires because it no longer has sufficient manufactured material (of the nature of glycogen) at its command which will enable further contraction to take place, breaking down into lactic acid, carbonic acid, &c., or because the muscle-fibres have become clogged by the non-removal and the accumulation of such poisonous products of decomposition.

But the ergographic tracing is not a simple record of either of these conditions. For, when the subject has reached the stage when he is quite impotent to produce further movement of his finger, he will immediately be able to furnish another good ergogram, if the weight which his finger is lifting be slightly reduced. From another aspect, too, the stage of absolute exhaustion which he has reached is only apparent, so far as his muscle is concerned. It will still readily contract if the stimulus of an electric current be applied to his arm over the appropriate peripheral motor nerve. The so-called fatigue effects revealed by the ergograph are very largely of nervous origin, due to afferent impulses ascending from the tiring muscle and inhibiting the transmission of efferent impulses which would otherwise throw it into action. They are protective against truly muscular exhaustion, and we are ignorant of the relation between such nervous inhibition and the degree of truly muscular fatigue occurring. We do know that under conditions of severe general fatigue such inhibition may fail, and thus a better ergographic tracing—i.e., a larger amount of work—may be compatible with increased fatigue. Such an experience occurred to my knowledge during a prolonged series of ergographic records daily taken by the late Dr. Rivers, who one day felt so tired from an exceptionally

arduous day's mental work that he was sorely tempted not to tire himself further with the taking of the usual evening's ergograph tracing. But, resisting the temptation, he obtained one of the best records of muscular work throughout the whole series of his experiments.

We have also to remember that the conditions under which the industrial worker carries out his daily work are very different from those under which an ergographic record is taken. The worker does not confine himself to the use of a single muscle. By varying his posture, as he tires, he often brings other muscles into play to carry out the same operations as heretofore. He does not work his hardest at each muscular contraction, as the ergograph demands of its subject. More or less unconsciously he adapts his expenditure of work to the length of his unbroken working spell or working day.

The fatigue which such a worker suffers is not merely or principally a fatigue of effort; it is also largely a fatigue of skill. There is no industrial work that is, strictly speaking, unskilled. For there is no occupation in industry in which there are not good and bad methods of carrying it out. The best worker is he who has become expert in the use of the best movements. He acquires his skill by coördinating visual, tactual, or auditory sensations with movements, by synthesising relatively simpler, previously acquired movements with one another so as to perform more complex movements, and by analysing and suppressing needless movements so as to obtain cleanness and economy of movement just as a clever artist eliminates all but the essentials in a sketch or caricature. Coördination, integration, and inhibition are thus the essential nervous processes for securing the minimal expenditure of muscular effort and for yielding the maximal efficiency of output. At the same time, the field of consciousness becomes reduced both in extent and in intensity. The need for widely diffused attention and for continuous judgment becomes replaced by the establishment and maintenance of an appropriate conscious attitude or posture in which the work is carried out to a large extent automatically. When fatigue arises, the discarded conscious attention to details is revived. Voluntary effort replaces intuitive behaviour, but with much less success. Output is reduced not only in quantity, but also in quality. The expert worker falls to the level of the inexpert worker. Old faults reappear. Finally, disorder replaces order of movement.

Moreover, apart from the fatigue of muscular contraction, there is a fatigue of the posture of the muscles employed, a fatigue of the central nervous "set" which is responsible for the preservation of the favourable posture, a fatigue, it may well be, of the directive process establishing that set. Lastly, not only are the various simultaneous movements integrated together by practice so as to form a single whole, not only is there this integration of a spatial kind, but practice also brings about an integration of a temporal kind. Successive movements are integrated together, and here the influence of rhythmical performance is of the greatest aid. The value of acquiring a proper rhythm in repeated movements can hardly be exaggerated. This kind of integration likewise breaks down in fatigue.

We see, then, that if, so far as the performance of movements is concerned, industrial fatigue is to be viewed in the light of a fatigue of acquired skill, we are far removed from an explanation of industrial fatigue in terms of muscular metabolism. The fatigue must be traced largely to disorders of nervous integration, inhibition, and coördination. Its site must lie in the central nervous system.

Illustrative Examples.

Two examples, illustrative of this conclusion, may be cited from the reports of the Industrial Fatigue Research Board. In the course of their investigations into the process of "buffing" Farmer and Brooke [1] obtained wattmeter records of workers roughing (removing imperfections and scratches from) spoons and forks throughout the day. These records enabled the experimenters to detect the varying number and duration of the strokes and the varying pressure with which the workers applied each spoon and fork to the polishing wheel. As the output diminished during the day's work the worker's strokes increased in number and duration, while the pressure with which the strokes were applied became greater. In other words, with the onset of fatigue, the worker began to use extravagant energy, although the output was diminished. The skilled worker became an unskilful worker, just as happens in sport with a tired eight or a tired golfer.

The second example [2] illustrates a natural corollary from our results—namely, that it is the less efficient worker who is most susceptible to fatigue. In their investigations in boot and shoe factories, Loveday and Munro observed that those workers who achieved a high output suffered far less than their relatively inexpert comrades from the fatigue of the week's work. Whereas the latter would reach their highest output at the middle of each week and fall off, often considerably, towards its end, the former would maintain their high level to the end of the week with very little or no diminution. We conclude that it is the unskilled and less productive worker who uses the most effort and who is the first to tire.

PHYSIOLOGY OF FATIGUE.

Industrial fatigue being thus pre-eminently due to fatigue of the central nervous system, we turn expectantly to our knowledge of the physiology of central nervous fatigue, but only to find an almost complete ignorance of the subject. So far as the white matter is concerned, nerve-fibres are believed to be virtually indefatigable; the peripheral nervous impulse appears to be of a physical rather than a chemical nature; the metabolism of the brain and spinal cord has so far proved almost inappreciable in detectable effects.

The physiological study of the fatigue of reflexes has yielded strange results, inexplicable by present conceptions of its nature. Fatigue in the central nervous system, as mechanically conceived on the basis of the study of isolated muscle, appears to be safeguarded by "the interplay of opposed agents," [3] those of excitation and inhibition, each of which must be regarded as a relatively separate, active process and presumably as separately amenable to fatigue.

We started by treating the human organism as a mechanical engine which becomes tired when it has no longer any explosive material at its command or when it becomes clogged with the products of its combustion. But we have been led to consider central nervous fatigue as consisting not so much in the wearing out of the processes of excitation and inhibition, as in a loss of coördination, a regression from later acquired skill to lowlier earlier levels of movement, the substitution of disorder for order, the loss of higher control, organisation, and direction. Further, physiology is at present powerless to lead us. It can only recognise the facts. Biology now admits that the living organism is something more than a mere mechanism, that mere chance variations are inadequate to explain the evolution of the living world, that order and direction, culminating in purposeful individual minds, have to be taken into account. We have reached the conclusion that industrial fatigue is primarily a breakdown in that order, a loss of coördination and direction, an impairment of that psycho-physiological feature which in its highest manifestation distinguishes the mental from the merely living, in its lowest the living from the purely mechanical organisation.

[1] Reports of the Industrial Fatigue Research Board, No. 15, pp. 45–54.

[2] Ibid., No. 10, pp. 16–28.

[3] Sherrington: Proc. Roy. Soc. B, 1925, xcvii., 543.

MEASUREMENT BY EFFECTS.

In our impotence to express this change in mechanical terms, we can only measure industrial fatigue by its direct effects. We can only safely study its effects by recourse, not to the interpolation of so-called fatigue tests, but to the actual industrial work curve. We need to measure output hour by hour throughout the working day and to study how the output rises and falls both in quality and in quantity at different hours of the day, on different days of the week, and so on. We study both curves of total output and curves of spoilt work for different kinds of work. We introduce improvements in environment—in illumination, ventilation, temperature, &c.—improvements in arrangement of the worker's material, improvements in the worker's posture, and the number, nature, and rhythm of his movements, the introduction of rest pauses in a long previously uninterrupted spell of work, better selection of the worker according to his innate abilities and interests. And we separately study the effects of these changes, one by one, upon the work curve.

We know that when the worker starts his work he has to get into his stride, to warm up to his work, to overcome distraction, to settle down to a rhythmical method of working. We know that when he resumes work after a pause he also suffers at first from having to overcome such detrimental effects. But the psychologist does not confuse these effects with loss of practice. A few minutes' absence from work does not produce any loss of skill any more than does a few minutes' pause between the repetitions of a well-learnt poem produce a loss of memory. What is lost in a short rest pause is not loss of practice but loss of what the psychologist calls incitement and settlement.[4]

During a rest pause, moreover, the effects of fatigue disappear, and in general the beneficial effects of a rest pause so far outweigh the detrimental ones that an increase in output results despite the somewhat lessened period of time actually spent at work. Thus, in the operation of packing, Farmer and Eyre, experimenting on behalf of the National Institute of Industrial Psychology,[5] obtained more than a 5 per cent. increase of output after introducing a rest pause of seven minutes in the middle of the morning's and afternoon's work, although by so doing there was a reduction by 3 per cent. in the total number of hours worked. The National Institute obtained by similar means a similar result—more than a 5 per cent. increase of output was obtained by Miles and Bevington[6] in the process of polishing celluloid articles. Other increases, varying between 5 and 10 per cent. of output, are recorded by the Industrial Fatigue Research Board.[7]

We have yet to ascertain why rest pauses are apparently in exceptional cases of no avail. Where they have succeeded the workers have eagerly welcomed them, preferring definite organised rest pauses to the irregular periods of rest which they would otherwise have surreptitiously taken in a long officially unbroken spell of work. Rest pauses require for their successful introduction a careful preliminary study of the work curves, so that the best moment for their introduction and their duration may be determined. The work curves also require study for an accurate realisation of the effects of the rest pause. Mere increase in output is not a sufficient result to please the industrial psychologist. He demands not merely a higher *level* of curve, but an improved *form* of curve. Particularly he wants to avoid a severe fall of the work curve towards the end of the working spell.

The good effects of a rest pause, as, indeed, the good effects of reducing the total number of hours worked, may not be fully evident until several weeks or even months have elapsed. The worker needs time to become adapted to the more advantageous conditions of his work. Ideally each worker needs a different length of rest pause and a different moment for its introduction in order to produce its best effects. In practice, however, the workshop, like the school class, has to adopt procedures which are most advantageous to the majority of its members.

MENTAL FACTORS.

The work curve is likewise complicated by the presence of spurts—one of which is specially apt to occur when the end of a piece of work or the end of a spell of work, or the approach of payment is in sight. Besides the end spurt there may also be an initial spurt, when the worker comes fresh to his task with a degree of energy which soon falls off after the first few minutes. The work curve is also marked by spurts and falls at other periods, due to various mental and physical influences.

Of these mental factors the most important are of affective nature. The worker's feelings alter at his work. The feelings are of enormous importance in influencing mental and muscular work. On the one hand, they may conflict with the general attitude he has to maintain and the efforts which consciously or unconsciously he has to expend; or, on the other hand, they may assist in those directions. Irritation and boredom are obvious examples of the former, contentment and interest of the latter.

The influence of feelings of pleasure and displeasure and of excitement and depression on the muscular effort of which a person is capable have long been recognised by physiologists and psychologists. But the influence of conflicting feelings on the orderly character of mental and central nervous processes was only adequately realised after experience of the psycho-neuroses arising in the course of the war. The phenomena of disorder and regression there met with are but a pathological exaggeration of the same phenomena which I have stressed earlier in this address as occurring in industrial fatigue.

Just as efficient muscular work demands the maintenance of a favourable posture, so efficient mental work demands the maintenance of a favourable attitude. This attitude is, of course, maintained more easily in states of contentment and interest, less readily in states of resentment and boredom. So long as the worker is happy and interested, the favourable attitude can be preserved without effort; its preservation involves the successful inhibition of all antagonistic, incompatible attitudes. Such inhibition is apt to tire when interest fails. Discordant ideas or movements are no longer automatically suppressed. They become manifest and themselves inhibit industrial work. Conscious voluntary effort has to be invoked in order that the mental or motor task may be continued. As this wearies, boredom is felt and the need for a change of attitude becomes imperative.

We now realise how far the boredom arising from an uncongenial task may be safeguarded by a more careful selection of the worker. Too intelligent a worker for the kind of repetitive work in which he is engaged may be as unsuitable as a worker who has not sufficient intelligence for another job.[8] The work must be adapted not only to the level of general intelligence, but also to the special abilities of the worker. As a general rule, the dull worker prefers a more monotonous job. He does not want change. He safeguards himself against boredom by recourse to the phantasies of day-dreaming, to conversation, song, &c.

The effects of boredom are at first those of localised fatigue. They may be dispelled by a change of work. It has recently been found by Vernon and Bevington[9]

[4] Myers: Text-book of Experimental Psychology, Part I., pp. 180–187.
[5] Jour. of Nat. Inst. Ind. Psych., vol. i., pp. 89–92.
[6] Ibid., vol. ii., pp. 269–273.
[7] Industrial Fatigue Research Board Report, No. 25.
[8] Burnett and Wyatt: Jour. of Nat. Inst. Ind. Psych., vol. ii., pp. 18–30.
[9] Industrial Fatigue Research Board, Report No. 29 p. 48 ff.

that changes of muscular posture are extremely effective in preventing the signs of fatigue. So, too, the change of mental attitude produced by a change in the character of work may be fully as effective as the introduction of a rest pause. In one investigation Miles and Skilbeck, on behalf of the National Institute of Industrial Psychology, obtained an increase in output amounting to 14 per cent. by allotting two short periods of the morning's and afternoon's work to the collection of material by the worker, instead of distributing that collection, as had happened for the most part previously, over the working day. Similar results have since been obtained in laboratory and factory experiments conducted by Vernon and Wyatt for the Industrial Fatigue Research Board.[10]

How far boredom is an important factor at the present day in reducing industrial output cannot easily be determined. The worker's initial spirit of "buck" and interest upon entering an occupation may be so easily broken after a few weeks' engagement on routine work that he soon becomes adapted to carry out his work by recourse to those safeguards against intolerable boredom which I have already mentioned. But if actual boredom is lacking, there can be no doubt that a vast increase in quantity and quality of output could be effected if steps were taken by introducing adequate incentives to increase and to maintain the worker's interest, and hence his conscientiousness. A careful study of the most effective incentives to efficient work is therefore of the greatest importance.

INCENTIVES TO EFFICIENT WORK.

One of the National Institute's investigations[11] affords a striking demonstration of the improvement upon quality of output which may result from alleviation of the workers' irritation, annoyance, and worry. It was concerned with the breakage of china in one of the tea-shops of a large catering firm, and its success was largely due to an early recognition by Miles and Eyre, the investigators, that carelessness was not an adequate explanation of the breakages. Records were carefully taken every two hours throughout the day showing where, when, and what articles were broken. Danger points were thus revealed, and so far as possible removed. But the investigators' attention was mainly directed to overcoming the *psychological* causes of breakages, diminishing discomfort, overstrain, and sources of irritation, and facilitating the flow of work. Curves of breakage frequency, in other words of spoilt work, were constructed both before and after the changes recommended by the Institute had been carried out. Not only was there a diminution of over 53 per cent. in the number of breakages, not only was the curve of spoilt work at a lower level throughout the day, but it showed a far better form. The previous well-marked rise of the curve towards the end of the day's work disappeared. We may reasonably conclude, therefore, that removal of the sources of worry and irritation materially reduced the workers' fatigue. They expressed unfeigned appreciation of the improvement in working conditions introduced by the Institute.

The curve of spoilt work throughout the day has been shown by Ryan and Sargant Florence[12] to be characterised by the same features as that of output, though, of course, in inverse direction. It tends to be greatest during the initial and final hours of the morning's or afternoon's spell of work. It is also greatest among the less expert workers. The causes and hourly frequency of industrial accidents show a close resemblance to those of spoiled work. Over-pressure and irritation, especially when accompanied by fatigue and inexperience, increase the hourly frequency of accidents. Mere fatigue alone may not do so. For the worker may for a time at least work equally cautiously, but at a far lower level of output. It is when he is unduly pressed or excited that spoilt work or accidents become more frequent, and especially when such over-pressure, irritation, and worry are so great as, or have continued long enough, to be associated with fatigue.

[10] Ibid., No. 26.
[11] Jour. of Nat. Inst. Ind. Psych., vol. i., pp. 132–140.
[12] Ibid., vol. i., pp. 193–197.

FATIGUE OR INHIBITION?

At the outset we might have been disposed to define industrial fatigue as that result of previous industrial work which is manifested as a diminution in output. But, as has been shown, fatigue may temporarily result in an increased amount of work due to the tiring of higher-level inhibition and control, and it may result from many other causes than that of previous industrial work. The worker may for quite other reasons come to his work in a fatigued state. His lack of training, his use of needless movements, his whole mental and physical environment may be the true causes of his fatigued condition rather than the number of hours which he has already worked.

Further, diminution of output as the work continues may result not only from fatigue, but also from lack of incentive or boredom, resentment, and worry—causes which if prolonged and resisted will ultimately cause fatigue, but the removal of which in their early stages of occurrence will at once produce a rise of output. Their adverse influence on output is initially due to temporary inhibition. How are we to distinguish industrial fatigue from inhibition? Only, I think, by observing the effects of removing their respective causes. If the reduction of output at once disappears, we may justly attribute its causes to previous inhibition. If the reduction of output is gradual, we may (with less certainty) attribute its cause to previous fatigue.

In the majority of cases under present-day conditions industrial fatigue is not to be reduced by shortening the hours of the day's work. It is to be combated rather by the avoidance of too long uninterrupted spells of work, by the introduction (after careful study of the work curve) of rest pauses, and of change of work and posture, by determination of the best movements of the worker, by systematic training of the worker in those movements, by selection of the worker so that his occupation is adapted to his innate abilities, by the abolition of causes of needless resentment, irritation, and worry, by the introduction of suitable incentives to work, by the provision of a good physical environment in regard to illumination, temperature, humidity, ventilation, food, &c.

As we have seen, industrial fatigue is too complex, and our knowledge of the physiology of the nervous system is too rudimentary, to allow of a definition of its character in physical and chemical terms. Indeed, it may be of a nature that forbids complete definition in the language of pure mechanism. At present it can only be studied and estimated by means of industrial work curves—curves of output and curves of spoilt work, indicating variations in the quantity and the quality of the worker's products. We must never forget that industrial fatigue involves not merely a diminution in the quantity of the worker's available "energy," but also a lack of harmony, a disorder of the various nervous processes which determine his performance of mental or bodily work.

MIDDLESEX HOSPITAL MEDICAL SOCIETY.—The annual special meeting of this society will be held at the Middlesex Hospital, London, on Tuesday, May 12th, at 8.15 for 8.30 P.M., when Lord Justice Atkin will deliver an address entitled Medicine and Law.

HEALTH AND PSYCHOLOGY OF THE CHILD.—A series of six lectures on this subject, addressed to matrons of day nurseries, children's nurses, teachers, and mothers, will be given under the auspices of the National Society of Day Nurseries at Carnegie House, 117, Piccadilly, London, W., on Tuesdays at 7 P.M., from May 19th to June 23rd. The lecturers are Dr. Alice Hutchison, Dr. Sloan Chesser, Dr. Kenneth Dickson, and Miss Liddiard.

THE PRACTICE OF ARTIFICIAL LIGHT-BATH TREATMENT.

BY J. H. SEQUEIRA, M.D., F.R.C.P. LOND., F.R.C.S. ENG.,
PHYSICIAN TO THE SKIN AND PHOTOTHERAPY DEPARTMENTS, LONDON HOSPITAL;
AND
W. J. O'DONOVAN, O.B.E., M.D., M.R.C.P. LOND.,
CHIEF ASSISTANT, SKIN DEPARTMENT, LONDON HOSPITAL.

THE value of sunlight in the treatment of certain forms of tuberculosis [1 2] and of rickets [3] is established. It is also recognised that artificial light can be utilised to replace and supplement the sun's rays.[4] The object of this paper is to place on record our experience with artificial light-baths during the past two and a half years in the hope that it may be of assistance to other workers in the same field. Before discussing the practical aspect we think it will be of interest to review briefly the important biological research which has been carried on pari passu with the clinical observations.

Historical Survey.

The Romans appreciated the benefit of the sun-bath, though it does not appear that they attributed any therapeutic properties to it. The solarium was either on the top of a flat-roofed house or a gallery above a porch, and though open all round was often covered by a roof. Here a portion of the day was spent in "slacking" in the sun.* The close resemblance of the Roman solarium to the sun-baths in the Higher Alps is sufficiently obvious.

The earliest reference in literature to the actual use of light in the treatment of disease is found in the well-known passage in the "Rosa Medicinæ" of John of Gaddesden (1280–1361),[5] who claimed to have cured a royal prince of small-pox by keeping him in a chamber from which all radiations but the red were excluded. This was probably based on some previous experience and may have come from the East, where such a measure is believed to have been used in the remote past. Finsen, to whom we owe so much in the scientific development of phototherapy, was of opinion that the essential factor in red light treatment (as used in variola) was the exclusion of the ultra-violet rays,[6] but some recent work with a neon lamp, which gives red rays, suggests that these radiations may themselves have a definite therapeutic effect.

Therapeutic Activity of Different Parts of Spectrum.

It has been determined that the various parts of the visible and non-visible spectrum have different therapeutic activities, and in time it is hoped to be able to state definitely what portion of the spectrum is responsible for the clinical phenomena observed. Experiment has shown:—

1. That infusoria can be immobilised by exposure to a mercury-vapour lamp, but that the time required is lengthened by simultaneous exposure to red rays (Hill and Eidinow[7]). This antagonism has also been observed by Hess in experiments on rats with combined radiations.

2. That rats fed on a diet deficient in vitamin A cease to grow normally in from seven to ten days. If rats so fed are subjected for ten minutes every second day to the radiations of a mercury-vapour lamp the growth of the animal is normal for from 35 to 50 days. After that symptoms of vitamin-A deficiency occur and xerophthalmia develops.[8]

3. The development of rickets is prevented in rats fed on a rickets-producing diet by a daily exposure for 15 minutes to a mercury-vapour lamp.[9]

4. That the bactericidal power of a rabbit's blood against staphylococcus can be greatly increased temporarily by exposing the shaved skin of the animal to the mercury-vapour lamp. This phenomenon lasts for two or three hours, but can be reproduced by further exposure to the source of light. This reaction is not restricted to epidermal cells, for an exposure of the ileo-cæcal portion of the small intestine gave rise to a similar increase in the hæmo-bactericidal power. Controls treated in like manner without irradiation gave negative results.[10] It has also been demonstrated by Colebrook that the hæmo-bactericidal power in man may be increased by light-baths, but that in some instances the exposure of the whole body to actinic rays may diminish this power.[14] This operation may explain why some cases of pulmonary tuberculosis "flare up" after sun-baths, a contingency well recognised in sanatoria. Colebrook, Hill and Eidinow find that the hæmo-bactericidal power in man does not increase unless an erythema is produced.[12] This observation suggests to us that there must be some other explanation of the benefit derived by tuberculous subjects from light-baths, for many of our patients have shown marked clinical improvement without the production of an erythema.

Pigmentation.—We find that clinically we can produce more rapid pigmentation with the carbon arc than with the mercury-vapour lamp, and in the majority of patients the pigmentation after carbon arc treatment is of a redder brown, while that of the mercury-vapour lamp is greyer. Some patients, both brunettes and blondes, do not pigment at all, and in spite of this they show clinical improvements.

5. An instrument has been designed by which the ultra-violet light may be measured. It consists essentially of a wedge-shaped glass envelope containing a standard solution of acetone methylene-blue, and the degree of bleaching has been standardised by the exposure required to kill hay infusoria.[11]

Clinical Observations.—Actinic light is used in treatment in two ways: (1) local treatment by concentrated light, particularly applicable to the form of tuberculosis of the skin known as lupus vulgaris; and (2) by subjecting the whole body to the sun's rays or to a powerful source of light rich in actinic radiations.

Local Treatment by Concentrated Light.

In his early experiments Finsen used the sun, focusing its rays through a large lens containing a blue solution on the affected area of skin. At the focus was placed a compressor formed of a ring of metal with two plates of rock crystal. The compressor was used to render the parts anæmic, it having been found by experiment that the red colouring matter of the blood prevented the passage of the actinic rays of light. The compressor was also used to cool the parts, and for this purpose a current of cold water was kept constantly circulating through it. Without this cooling the patient was unable to bear the heat produced at the focus of the sun's rays. It was soon found, however, that in Copenhagen, as in other countries in northern latitudes, the sun was too unreliable as a source of illumination, and powerful electric arcs were substituted for it. The light from these arcs was passed through a series of lenses in a telescope tube and focused on the affected area of skin. The compressor was used as in the sun treatment. By the original Finsen apparatus eight patients were treated at a time. A modification devised by Reyn for the treatment of one patient on the same principles has been found equally efficacious. Trials were made of other illuminants—e.g., a lamp with iron poles giving a highly actinic light was devised, but was eventually discarded.

Mention must, however, be made of the ingenious Kromayer lamp which is of considerable utility in certain types of case. This consists of a U-shaped envelope of rock crystal containing mercury vapour. It is enclosed in a capsule of metal with a rock-crystal window. Through the outer capsule a constant current of cold water is passed. The rays developed in the mercury vapour are highly actinic and the window is pressed firmly against the part to be treated, so that the area is rendered anæmic and can thus be penetrated by the actinic rays. In our experience

* We are indebted to Dr. Brownrigg, headmaster of Magdalen College School, Oxford, for interesting information on this point, and a reference to a criticism in Plautus (Miles Gloriosus) to a house which had neither a garden nor a solarium.

the Kromayer lamp has a sphere of usefulness particularly for lesions on the body and limbs.

If treatment is carried out with a careful observance of Finsen's technique, from 60 to 70 per cent. of cases of lupus vulgaris can be cured. The inflammatory reaction following the application of concentrated actinic light destroys the infecting organisms, and replaces the diseased tissue by a soft, supple, healthy cicatrix. The failures are due to (*a*) extensive disease of the mucous membranes, especially of the nasal cavity, and (*b*) a type of the disease too active for the necessarily slow treatment to keep pace with its extension.

The Light-Bath.

The sun-bath was originally introduced for the treatment of surgical tuberculosis in Switzerland by Bernhard,[13] and the clinical application has been developed by Rollier. At first it was thought that the undoubted benefit which followed the exposure of the nude body was mainly due to the high altitudes, but it is now known that the important factor is the light. In the Alps the air is clearer than in lowland countries, and there is less absorption of the actinic rays by the atmosphere. At the seaside the actinic value of the sunlight on clear days is higher than inland, but in winter in northern latitudes the chemical activity of the sun's rays, even on bright days, is low. Hence the necessity for artificial illuminants.

Lamps in common use are (1) large carbon arc-lamps with or without tungsten paste cores; and (2) mercury-vapour lamps. Tungsten arcs have also been used, but we found that these had practical disadvantages. Our remarks apply to carbon arcs with tungsten paste cores and mercury-vapour lamps.

Apparatus.

1. We do not advocate the use of any particular *source of illumination*. We have to consider expediency as well as theoretical light-values. For instance, we must modify our methods according to (*a*) the time that the patient can spare for treatment; (*b*) the pressure of numbers; (*c*) the convenient formation of manageable groups of size and age (we find it inconvenient to treat adults with children owing to the level at which the source of illumination is placed with regard to the patients); (*d*) infectivity—it is unwise to place a patient with cough or discharges in proximity to other patients; (*e*) whether the patient can come to the lamp or a portable illuminant must be used (the voltage available in the latter case is an important factor); (*f*) the standard of training of the assistants. One form of illuminant is fool-proof, while another—e.g., the mercury-vapour lamp—requires trained and informed care.

2. *Type of Illuminant.*—No consideration whatever can be given to any light which is glass-enclosed. Glass is almost impermeable to ultra-violet light.

Carbon Arc.—Small or large carbon-pencil arcs are equally valuable if the law of inverse squares is borne in mind—i.e., a small group or single patient placed before a 25-ampère lamp, or ten children or eight adults around a 75-ampère lamp would give equally good results. If carbons with a tungsten paste core are used a light of high actinic value is obtained, a light whose spectrum more closely approximates that of sunlight than with any other form of illuminant. Such lamps are mechanically dependable, owing to their long use by electrical engineers as public illuminants. The only difficulty is the regular approximation of the carbon pencils as they burn away, and this is efficiently met with in any type designed for continuous use. An arc that will burn for four hours without replacement of carbons is all that is required. The group treatment of patients around an arc lamp is attended by heat and stuffiness to an extreme degre. This can be overcome by efficient ventilation, and when this is impossible the discomfort ceases if an efficient ozonising apparatus is installed. For convenience of electrical supply two 24-ampère lamps can be used together as a unit rather than one lamp of higher ampèrage. A lamp of high ampèrage might require the installation of a motor transformer.

Mercury-vapour lamps have certain advantages. The initial cost is low, the lamps are portable, and the current required may be obtained from ordinary lighting circuits. No mechanical attention is necessary during the ordinary life of the "burner," which is approximately 1000 hours. It is fragile, replacement of the burner is expensive, large-group treatment is impracticable, and the best results have always been obtained by treating patients singly or at most in pairs. Great care is needed for the protection of the eyes of both patient and attendant, as painful conjunctivitis may follow a very short exposure. Children, particularly, require constant watching under this light, as they tend to interfere with the apparatus and approach too near to the source of light. Careful timing here is of first importance, and is to be obtained by the use of a cardboard clock-face, the hands of which can be set for the time of the determination of the dose, and by always having the patient facing a dependable clock and telling him that when his time arrives he must leave the lamp. This precaution is taken in case the nurse should by any accident be prevented from giving the necessary warning. We prefer this method of working to the installation of an automatic cut-out worked by a clock, since the frequent interruption and restarting of the lamp at intervals that may be as short as two minutes, throw an undue strain on its construction, and, furthermore, at each restarting time is lost while waiting for the incandescent vapour to acquire its full actinic value. When absolutely new the reaction is more intense than when it has been in continuous use for 24 hours, but after that, certainly up to 600 hours, its reaction has appeared to us to be remarkably constant. In an old burner the quartz becomes opaque, and longer exposures are tolerated by the patients. It is therefore important to bear this in mind when replacing an old burner. The exposures then should be re-timed as from the start.

Clinical Dosage.

Generally the initial dose, which can be borne with comfort, should give rise to no more than an evident reddening of the skin and a not unpleasant conscious tingling. Experience of initial doses over the last two and a half years has never shown any ill-effects of an exposure of half an hour to the carbon arc light or of two minutes to a 6 in. mercury-vapour burner. It is a fact that after an exposure of two minutes a patient ceased to attend the department when a doctor called in hinted at a diagnosis of scarlet fever, but the patient attended the day following and received a second "erythema dose" without distress or injury to the skin. With either of these initial doses desquamation, in the form of large dry flakes, may be widespread or may not occur at all. We have never seen blisters form, however intense the reaction within this timing, or however widespread the desquamation may have been. From our observation more severe reactions are given by the skin of brunettes, who also in turn exhibit far more intense pigmentation as time goes on. We meet with blondes whose reaction, at first acute, after many doses is often imperceptible, yet the improvement in their physical state goes on. It has been suggested that a trial dose to a limited area of skin would be of assistance in the dosage of new patients. We have not yet found any disadvantage in proceeding on the lines of gradually ascending doses from our ascertained safe initial exposure.

The stages of increase are, for administrative convenience, ascended at weekly intervals. The carbon-arc exposure is increased by half an hour at a time up to a maximum of four hours per diem. If at any time the skin is noted as being erythematous, with or without pigmentation, the dosage is not increased. In the mercury-vapour cases the initial two minutes to each side of the body is increased weekly by a minute to either side, to a maximum of 20 minutes to each side.

Intermissions due to illness, holidays, menstruation, call for watchfulness. An interval of up to four days calls for no alteration in the time of exposure. A month certainly means a resumption of the initial dosage—e.g., half an hour of the carbon arc or two minutes of the mercury vapour. An intermission of a fortnight requires a halving of the maximum then reached. Omission of this precaution has given rise to painful severe erythemata. In practice we find it unnecessary to differentiate between the children and the adult patients as regards the initial exposure. For rickety babies we have not exceeded a maximum exposure of two and a half hours to the carbon arc. The standard distance of the patient's exposed skin

from the source of light is assumed in all cases to be three feet, and so far we have applied this system of dosage to all types of disease submitted, but enlarged experience may lead us to introduce modifications. We think it is an advantage to maintain the patient in a sitting, standing, or recumbent position throughout his treatment. Exposure of ambulant patients appears to offer no special advantages. Areas of skin reacting from any local treatment or in an ulcerated condition, are carefully protected by a dressing while the rest of the skin is exposed. If this is not done the patient will complain of pain and discomfort, and there is no appreciable therapeutic benefit.

Protection of the eyes in all cases is necessary when the front of the body is under treatment. Smoked glasses in practice are always discarded for brown-paper masks. For small children closely-fitting leather and elastic eye-shades are used in which are inset deep-tinted glasses.

Physiological Effects.

The physiological effects observed on patients while exposed or after exposure to the light-bath made in our clinic are as follows:—

1. The *basal metabolism* was examined in a number of patients before and after light-bath treatment by Dr. Argyll Campbell, of the National Institute for Medical Research. No change was observed in the patients examined.
2. *Blood Counts* were made in a number of patients but no material alteration was noted. In some there was a slight increase in the leucocytes.
3. *Body Weight.*—If below the normal the body-weight was found to be increased by light-bath treatment.
4. *Growth.*—In children it was found that the rate of growth increased to but not beyond the normal.
5. *Mentality.*—Improvement was noted in all cases. Dull, lethargic patients became bright, and took an interest in their condition and appearance.
6. *Temperature.*—No change was found in the body temperature during or after the sittings.
7. *Pulse.*—The pulse-rate was unchanged.
8. *Respiration.*—The rate of respiration was not altered.
9. *Blood Pressure.*—Finsen was of opinion that hyperpiesis was directly affected; in fact, his early work on light-baths was directed specially to the treatment of high blood pressure. We found no change in patients with a normal blood pressure.
10. *Thirst.*—Our patients constantly complain of thirst.

Management of a Light Treatment Clinic.

The management of these clinics presents no difficulties that need prevent their widespread multiplication, save only that of initial expense and cost of running. The Ministry of Health have power to sanction contributions towards the cost of this installation and its upkeep by local authorities, but, naturally, the Ministry would be consulted in advance. Voluntary hospitals can come to arrangements with local authorities for "per capita" or for annual grants. The local M.O.H. is, of course, a mine of information as to the best manner in which to set this machinery in operation. Light clinics may be established as part of the armamentarium of a general hospital or infirmary. They may be set up for a special type of case—e.g., lupus—or for a special clientèle, as is found in a children's clinic, or sanatorium, or other specialised institution, where it may be used as a supplement to a general scheme of sunlight therapy.

Selection of Cases.—The majority of patients needing light treatment will be unable to pay for this during the necessarily long period of its continuance. External aid is a necessity if the clinic is to work successfully. Furthermore, continuity of attendance is essential. In all these matters coöperation with the local authority is of the greatest assistance. In some instances all that is necessary is the provision of a railway season, ticket, in others a lodging allowance. The provision of hostels in connexion with clinics attached to general hospitals is now being considered. Attendance of patients can be stimulated by health visitors and by school nurses. Early cases are picked out for treatment by school medical officers, and others by tuberculosis officers and infant welfare clinics, while the majority have been and will be sent for treatment by the watchful general practitioner.

The choice of patients to be treated must be left, naturally, to the discretion of the medical man in charge of the clinic. In practice we find it impossible to take on cases, however suitable, unless and until arrangements have been made to ensure the regularity and continuity of their treatment from the outset.

Briefly, the types of case likely to benefit by light treatment in a general light clinic are: (1) tuberculosis of bones and joints, of glands, of the peritoneum, lupus vulgaris of the skin and of the mucous membranes; (2) rickets; (3) blood disorders; (4) neurasthenia; (5) some forms of chronic arthritis; (6) *B. coli* pyelitis. Experience may add to these.

Cases of pulmonary and laryngeal tuberculosis should be treated only in institutions devoted to this special work, not only on account of their contagious nature, but owing to their need of special dietary and hygienic care, and the need of expert clinical supervision. No surgical case should be admitted unless referred by a competent surgical authority. We have had sent to us cases of spinal caries still needing orthopædic support and cases of rickets that required operative or instrumental correction of deformity. Blood diseases also must be watched by a hæmatologist.

Staff.—The medical officer needs the assistance of a fully-trained nurse as the patients come at all hours of the day, and, in our own experience, have arrived with measles, chicken-pox, diphtheria, herpes zoster, encephalitis lethargica, and minor fractures.

Education.—Owing to the necessity of the daily treatment over a long period of time the need of educational care must be shouldered. Illiteracy and indiscipline are bound to occur in children lodged for long periods away from home. Owing to the keenness of the London educational authorities all our non-contagious children of school age may now attend school for half the day. But arrangements have still to be made for the education of children coming from a distance and living in approved lodgings, in the neighbourhood of the clinic.

Reports.—To secure the willing coöperation of boards of guardians it is necessary to make careful clinical reports which we find it advisable to supplement by photographs. It is obviously to the advantage of the contributing authority to be fully informed of the attendance and progress of cases for which they have assumed responsibility.

We never allow ourselves to forget that diseases must be attacked from all sides at once. Rickets calls for dietetics as well as light treatment; lupus needs local as well as general therapy; tuberculous adenitis may need tuberculin injections; surgical tuberculosis may require aspiration or operative measures.

Light therapy, then, is a new weapon in the armamentarium of medicine, but the great convenience of concentrating patients in a special clinic has the danger that other measures valuable in expert hands may be neglected. We realise daily the great advantages that we as well as our patients reap by the fact that all the laboratories and specialised services of a general hospital are immediately available.

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(*Continued at foot of next page.*)

LIGHT IN THE PREVENTION OF RICKETS.

A Paper read at the Fourth International Congress of Thalasso-Therapy, held at Arcachon, April 27th to 29th.

BY FRANCIS HOWARD HUMPHRIS, M.D. BRUX., F.R.C.P. EDIN., D.M.E. & R. CAMB.

RICKETS has been called either a calcium-deficiency disease or a vitamin-deficiency disease, and it may be that it is either or both of these; but is it not essentially a *light-deficiency disease?* And therefore does it not follow that the prevention and cure of the malady lies with *light-sufficiency?* I think that the time will come when it will be generally acknowledged that light can prevent rickets as surely as vaccination can prevent small-pox, and is as valuable a means of cure as is antitoxin in diphtheria. The procedure, if simple, involves much time and a certain amount of trouble, but as a therapeutic possibility, surely well worth while.

Rickets is one of the diseases most amenable to the ultra-violet energy, and one in which the therapeutic value of this agent has been proved beyond doubt. For over 20 years experimental and clinical proofs have been frequently recorded. Literature, which, as a rule, is scanty where ultra-violet light is concerned, is prolific where this form of therapy is employed in rickets. Thirty-four years ago Dr. Theobald Adrian Palm published his views on the relation of sunlight to rickets,[1] and from then till the present time the medical journals have been publishing facts and results of ultra-violet radiation in the treatment of this disease, so that it would seem superfluous to enter fully into the subject here, and to discuss it superficially would be unsatisfactory.

The whole case may be summed up, somewhat baldly perhaps, by two definitions: (1) Rickets is a disease or aberrancy of the bony tissues due to, or characterised by, a calcium and phosphorus deficiency as well as by a lack of the fat-soluble vitamin A. (2) Ultra-violet therapy raises the calcium and phosphorus content in the body, and also increases the energy of the fat-soluble vitamin A. If the accuracy of these two definitions be admitted, it would seem that ultra-violet radiation is valuable in the pathological conditions shown in rickets.

Light and Metabolism.

The therapeutic action of ultra-violet radiation on metabolism opens up a wide field. It is known that these rays are absorbed by the blood, but we do not know how the end-products, resulting from the changes in the blood set up by this absorption, are stored, or in what manner or form these products are set free in the tissues. But that metabolism is profoundly and beneficially affected by them is now established beyond doubt. The good effect may be due to the chemical changes in the blood which follow the administration of ultra-violet rays. One of these changes is that the calcium content becomes higher, and another is that the concentration of inorganic phosphorus is increased by its means. The phosphorus and calcium increase in the blood is probably due to absorption of these salts from the bowel. It would therefore seem to be a logical corollary that, if an additional quantity of these salts were introduced into the bowel, the greater would be the opportunity for the ultra-violet radiation to abstract it therefrom.

[1] See the Medical Press and Circular, May 28th, 1924.

ARTIFICIAL LIGHT-BATH TREATMENT: REFERENCES.
(*Continued from previous page.*)

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It is probably mainly due to these chemical effects that ultra-violet radiation is productive of such good effects in rickets. This disease has in many cases been prevented and checked by the use of ultra-violet rays. Rats kept in darkness and deprived of certain food factors, notably vitamins, will develop rickets. If some of these rats be exposed to ultra-violet radiation, the diet remaining unaltered, the development of rickets in them is checked. The calcium and phosphorus content in the blood is responsible in a great measure for the integrity of bone structure, and for the growth and calcification of the skeleton. In this connexion it is interesting to note that Huldschinsky in 1919 placed it on record that at the Oscar-Helene Home for curing crippled children at Berlin ultra-violet radiation was more effectual than sunlight and cod-liver oil. He says: "Cod-liver oil as well as sunlight were found to be exceedingly slow in their action, the exposure to ultra-violet light yielding incomparably better results."[2]

Experiments with ultra-violet light on animals will illustrate the close relationship between light and diet in the ætiology of rickets, and show how the chemical changes, effected by radiation, produce good results. When the diet remains a constant standard rickets-producing diet, rickets will either develop or not, according to the dosage of light. Thus it was found that raying for two minutes daily with the mercury-vapour lamp at a distance of three feet afforded protection. Raying for only one minute was insufficient. Four minutes sufficed when a carbon-arc lamp was used at this distance, but two minutes were not long enough. There can be little doubt but that the same reciprocal relationship between light and diet prevails in regard to infantile rickets.

Calcium and Phosphorus Concentration of Serum.

A very striking table is quoted by Hill showing the percentage of calcium and inorganic phosphorus concentration of the serum of rachitic children before and after exposure to light. The figures are in milligrammes per 100 cubic centimetres of serum.

Calcium and Inorganic Phosphorus Concentration of Serum of Rachitic Children Before and After Exposure to Sunlight.

1922.	Calcium.	Phosphorus.	Product.	—
From June 10	8·8	2·8	30	Marked rickets.
to Aug. 2	11·1	5·0	55	Definite healing.
From Aug. 8	11·0	3·0	33	Moderate rickets.
to Aug. 24	11·2	5·9	66	Healed rickets.
From Aug. 11	10·6	3·0	32	Rickets.
to Sept. 7	9·2	5·9	54	Healed rickets.
From Aug. 11	9·3	2·8	26	Active rickets.
to Sept. 7	9·8	6·4	64	Definite healing.
From Aug. 16	9·3	2·5	23	Rickets.
to Sept. 7	9·8	5·9	58	Healing.
From Aug. 18	9·8	2·5	25	Marked rickets.
to Sept. 7	9·2	6·5	60	Definite healing.
From Aug. 21	7·9	3·1	25	Rickets.
to Sept. 7	9·0	5·1	46	Healing.

Some two years after this table was presented, very interesting results were published[3] of research work undertaken by Grant and Gates of the Rockefeller Institute. These bear out Hill's figures in a remarkable manner. The experiments consisted in exposing light-coloured, or albino rabbits to ultra-violet radiation for half an hour daily at a distance of one metre. The rays caused erythema with its usual sequelæ, desquamation and moderate pigmentation. The examination of the calcium metabolism gave the following results. It was found that the average concentration in the groups having been exposed to ultra-violet radiation for five, six, and seven weeks was over 12·7 mg. per 100 c.cm.

[2] Oscar-Helene Home for the Treatment and Education of Infirm Children, Berlin-Dahlem. Dr. K. Huldschinsky: Heilung von Rachitis durch Künstliche Hohensonne, Deutsch. Medizin. Wochenschrift, 1919, No. 26.

[3] THE LANCET, 1924, i., 913.

of serum, as compared with an average of 11·9 mg. per 100 c.cm. for 60 normal control rabbits.

In another set of experiments rabbits were given increased exposures of ultra-violet radiation daily over a period of four weeks, and in these animals the blood-calcium concentration rose from 11·9 mg. per 100 c.cm. of serum before exposure to 12·2 mg. on the twelfth day, 13·5 on the twenty-second day, and 12·9 at the end of the experimental period. It was noted that the later figures in both these sets of experiments showed a somewhat lower level in the calcium content. This is probably due to the protection afforded by the skin pigmentation caused by the ultra-violet light.

Effects of Light on Endocrine Glands.

These experiments show a further point of interest which has a distinct bearing on the subject, and to which I will briefly refer. It is this. The weights of the endocrine glands and testes all increased during the treatment. These were all recorded and the changes compared with the normal controls. The parathyroids showed the greatest hypertrophy, the percentage in their increase varied from 14·1 to 51·1 per cent. This increase in weight was due to a true hyperplasia of the parenchymatous tissue. The normal relationship between the parathyroids and calcium metabolism is already established, but these experiments are important as showing the effect of ultra-violet radiation upon them both, and, as the authors say, whether the light acts primarily on the absorption and excretion of calcium, and so causes a rise of the blood calcium, which results in a hypertrophy of the parathyroid gland, or whether the radiation primarily affects the glands themselves, remains to be determined. But this determination may rest for the present. The fact of paramount importance is that ultra-violet radiation has the power to raise the calcium content in the blood, and is a reliable therapeutic measure which will cure and prevent rickets. This being established, let us touch briefly on the technique of the practical prophylaxis of rickets. The treatment should begin as soon as pregnancy is proved. In the parturient female an increased calcium content is a consummation most devoutly to be wished. There is normally a great drain upon her calcium metabolism, as is often evidenced by dental trouble, and, owing to this drain, the seeds of rickets may be sown in the child before ever it is born. Hence, both for her own welfare, and that of her unborn child, let the expectant mother have some form of light therapy regularly for the duration of her pregnancy. Apart from being an insurance premium against the production of unhealthy offspring, the mother will experience a sense of health and well-being not always obtaining among women labouring with child, but which usually accompanies the administration of general light therapy.

Furthermore treatment by light should be continued throughout the period of lactation. What better prophylactic agent against the occurrence of rickets could be desired than the maternal milk rich in calcium salts? Steenbock and Black [4] have shown that if a rat's food ration, deficient in fat-soluble vitamin, were exposed to ultra-violet rays it became "activated" and produced as good growth and calcification of bone as if the animal itself had been irradiated, hence radiation of the child's food will tend to promote bone calcification. This is, of course, the counsel of perfection, and, at the present time, not practicable for the many, but it would certainly make for the prevention of rickets.

Prophylactic Light Treatment.

Coming now to the child who has not had these advantages derived from his mother, it has been recently suggested by Mellanby that the anti-rachitic vitamins in food are increased, or made more active, by exposure to ultra-violet radiations, and that these tend to conserve ingested calcium and phosphorus for the use of the growing organism. Another measure which would do much to eradicate this widespread disease of children would be the raying of every child for a month or six weeks during the first year of his life. Two or three times a week would be all that would be needed, and this would have far-reaching effect and produce results at which one can only hazard a guess, but which I venture to think would be comparable to the effect that vaccination has had upon small-pox. Fifty years ago one met in the streets on every hand eyes blinded by this scourge, and it seems to me that I can remember that one face in every ten or a dozen was pock-marked. To-day such a thing is a rarity. But rickets, its results, and infant and child mortality, which can be traced to its malign influence, all take heavy toll, and, though the prevention of rickets by the light treatment of every child may appear extravagant at first sight, the paramount importance to the population of the prevention of rickets cannot be exaggerated. It is not only rickets as an entity which it is sought to extinguish, but, just as it is recognised that rachitic children are more liable to infectious and other diseases than the non-rickety children, so, with the prevention of rickets, the liability to many illnesses which contribute to child mortality is diminished. The prevention of rickets in the children of the nation is a national duty, and so surely as it is performed a national reward will follow in the bringing up of a population, few of whom will appear in class C 3, but who will be sturdier and stronger by the elimination of a disease which for too long has weakened and depleted the peoples of many races.

[4] Jour. Biol. Chem., 1924, lxi., 405.

REPORTS ON TUTOCAINE: A LOCAL ANÆSTHETIC.

I.—PHARMACOLOGY.

By E. WATSON-WILLIAMS, *M.C.*, CH.M.,
CLINICAL LECTURER IN LARYNGOLOGY, UNIVERSITY OF BRISTOL.

TUTOCAINE is described as the hydrochloride of di-methyl-amino-methyl-p-aminobenzoyl-oxybutane, $C_{14}H_{22}O_2N_2.HCl$; molecular weight 286·6, alkaloid content 87·3 per cent. As the formulæ below indicate, it is related to alypine and closely to stovaine. From the latter it differs (*a*) in the placing of the benzoyl nucleus, which is attached to the *third* carbon atom from that carrying the alkyl amino group (as in butyn); (*b*) in having an amino group attached to the benzene ring in the para position, in common with several anæsthetics derived from simpler paraffins.

Tutocaine is supplied as a faintly creamy-white powder, consisting of microscopic crystals. (Tablets and ampoules are said to be available.) This is soluble in cold distilled water up to 12 per cent., and more soluble in warm. The solution is neutral and optically inactive. It has a very faint yellowish tint, which darkens slightly on keeping. It can be boiled for a *short* time without decomposition, but should not be autoclaved (tutocaine appears rather less stable than cocaine hydrochloride when heated). Care should be taken to exclude all traces of alkali, which decomposes compounds of this type; some glass is alkaline! With ordinary care the solution will keep good for several days in a stoppered vessel. It grows moulds readily, and if dispensed in a corked bottle the addition of 1 part per 5000 of salicylic acid will be found useful—so prepared, the solution seems to remain active for at least three months. The taste is bitter, without special features.

If preferred, normal saline may be used to dissolve or dilute tutocaine. Adrenalin may be added; if so, this should be done immediately before use. Tutocaine is insoluble in oils. It is not subject to the Dangerous Drugs Acts. The price has not been fixed.

Experimental Toxicity.[1]

Compared to cocaine hydrochloride, the toxicity of 1 g. of tutocaine, estimated by the subcutaneous

[1] The expenses of the experimental work described below have been defrayed by a grant from the Colston Research Fund of the University of Bristol.

minimal lethal dose for guinea-pigs, gives the following values :—

Strength of solution ..	0·25%	0·5%	1%	2%	5%	10%
Tutocaine	—	5·9	7·1	7·9	8·3	8·6
Cocaine hydrochloride.	11	16	20	23	25	26

These figures indicate the weight of guinea-pigs in kilogrammes killed by 1 g. of the drug, and are the reciprocals of the minimal lethal doses in grammes per kilogramme.

Measured by this scale, tutocaine appears about three times less toxic than cocaine hydrochloride, and rather more than twice as toxic as novocaine. With convulsions as our criterion, the same proportion as regards cocaine is observed (which is uncommon). "Excitement" seems to be produced by doses much below the fatal dose, about 1/10 of the latter in guinea-pigs; tutocaine should therefore prove very safe to use in clinical practice, as ample warning should be afforded of any tendency to exceed a safe quantity. The same property indicates that tutocaine may prove useful to the drug-taker, who might be able to get the minor toxic effects that he seeks with little risk of serious poisoning. When death occurs it is from respiratory paralysis, the heart failing after the respiration ceases. One fatal accident (urological) with tutocaine has been published (vide below). The vertigo, head retraction, excitement, pupil dilation, convulsions, &c., seen in a guinea-pig poisoned with tutocaine resemble those seen with cocaine very closely—more so than do the manifestations of any other substitute with which I have worked.

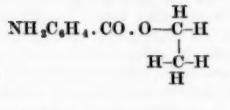
The cocaine efficiency ratio of a drug is obtained thus: The figure found for the anæsthetic efficiency, as compared with that of cocaine under similar conditions, is divided by the figure expressing the toxicity, as compared with that of cocaine. The latter is usually taken to be the toxicity deduced from the experimental minimal lethal dose, determined in suitable animals, by a method—e.g., subcutaneous injection—comparable with that employed in clinical application of the drugs. If we accept the value deduced below for the cocaine anæsthetic ratio of tutocaine—namely, 70 per cent., or 0·70 unit—and the value given above for the comparative experimental lethal toxicity (subcutaneous)—namely, one-third, or 0·33 unit—we deduce a value for the cocaine efficiency ratio of tutocaine of 0·70 divided by 0·33, or 2·1.

No laboratory investigations of the local effects of tutocaine have been made for the purposes of this report, since the clinical evidence seemed so much more valuable. The drug has been extensively employed on the continent as a substitute for novocaine by injection. Our main purpose was to test the value of tutocaine for anæsthetising mucous membranes. And so, although it has been used in a few cases for major operations, and also for limited subcutaneous anæsthesia, with great success, attention has been concentrated on the other aspect. The clinical reports given below are based on upwards of 500 observations by six clinicians working independently, in an endeavour to explore the field where cocaine is generally used in this country (including dentistry).

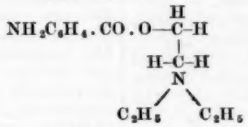
My thanks are due to Prof. I. Walker Hall for permission to carry out the experimental work in the pathological laboratory of Bristol University; and to Messrs. Bayer Products, Ltd., for the supply of tutocaine used.

Bases of Certain Local Anæsthetics: (1) Ethanol Series; (2) Propanol Series; (3) Iso-amyl Series.

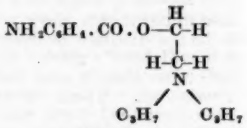
(1) *Ethanol Series.*



Anæsthesin.

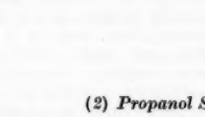


Novocaine.



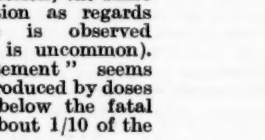
Isocaine.

(2) *Propanol Series.*

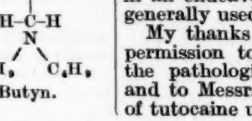


Butyn.

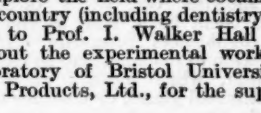
(3) *α-iso-amyl Series.* (= "*Butanol*" *Series.*)



Alypine.



Stovaine (Amylocaine).



Tutocaine.

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II.—RHINOLOGY.

BY P. WATSON-WILLIAMS, M.D. LOND.,
CONSULTANT SURGEON FOR DISEASES OF THE EAR, NOSE, AND THROAT, BRISTOL ROYAL INFIRMARY, ETC.;
AND
E. WATSON-WILLIAMS.

TUTOCAINE has been used by us (independently) since the early summer of 1924; the following conclusions are based on over 200 observations. Of these, operations such as septal submucous resection, exploratory puncture of the antrum, removal of polypi, cauterisation, conchotomy, &c., furnished some 70.

Anæsthesia.—In nearly all the cases a 5 per cent. solution was applied by spray or tampon; a few minims sufficed for superficial work, and up to two fluid drachms have been used for more extensive operations. We have not injected the solution. In a few cases, among our earlier observations, the anæsthesia appeared less satisfactory than with 5 per cent. cocaine hydrochloride. It was found that this was due to the fact that tutocaine takes rather longer than cocaine of the same concentration to produce its full effect. For example, in a certain situation the average time for cocaine was 2 min. 5 sec., for tutocaine 2 min. 50 sec.; as we were applying for three minutes, cases occurred in which the effect of the tutocaine was incomplete. Since this has been recognised and allowance made, there has been no case in which good anæsthesia failed. Nine operations were performed on subjects of "neurasthenia" selected as unfavourable patients, with complete success. From a consideration of the various findings, including the time factor, we came to the conclusion that a 5 per cent. solution of tutocaine gave the same results as a 3·5 per cent. solution of cocaine—that, in fact, weight for weight, the anæsthetic efficiency of tutocaine was 70 per cent. that of cocaine hydrochloride when applied to the nasal mucosa. The duration of anæsthesia (with adrenalin) was about 45 minutes in a few cases in which it was tested. Some observations were made with 10 per cent. tutocaine; the results agreed with our previous findings.

Shrinkage.—Special attention was directed to this point. We have come to the conclusion that tutocaine does possess some power of producing shrinkage in the nose. As compared with that of cocaine, it was considerably less (in most cases) and took longer to develop; even when complete, a further shrinkage can be produced by cocaine. Also, there seemed no effect in arresting hæmorrhage; for operative work the addition of adrenalin (1/10,000) was necessary, and perfectly satisfactory. It seems probable that two factors are concerned in regulating the width of the nasal passages: (*a*) the vascular engorgement or otherwise of the nasal mucous membrane; (*b*) the expansion or contraction of the erectile tissue of the turbinals. (*a*) Does not seem to be affected by tutocaine; a slight initial pallor occurs but is transient—the same can be produced by a spray of cold normal saline. (*b*) Seems to be definitely influenced by tutocaine, though more slowly than it is by cocaine. Those cases show most "shrinkage" in which the turbinals are most swollen.

Irritation.—No cases of primary irritation were seen. In a few of the rare cases where cocaine solution produces late irritation, tutocaine did not act in this way. One patient showed the difference especially well, and greatly preferred tutocaine.

Dr. Z., a colleague, aged 70, who required periodical inflation of the ears by Eustachian catheter. He always found that for 24 hours after the use of cocaine his nose ran to an extent sufficient to cause him great inconvenience. After tutocaine this did not occur (several observations).

Toxicity.—No case showed either local or general signs of any toxic effect. In three cases, selected because cocaine had previously caused disturbance, tutocaine did not do so.

CASE 402.—Female, 28. Had had nasal polypi removed three times under cocaine anæsthesia and had fainted after each operation. A polypus was removed under tutocaine without any disturbance; she was considerably surprised, for not knowing that cocaine had not been used she was expecting to faint this time too.

III.—OPHTHALMOLOGY.

BY E. R. CHAMBERS, F.R.C.S. EDIN.,
OPHTHALMIC SURGEON, BRISTOL ROYAL INFIRMARY;
AND
G. C. DIXON, F.R.C.S. EDIN.,
RESIDENT MEDICAL OFFICER, BRISTOL EYE HOSPITAL.

WE have used tutocaine in about 100 cases. Fresh solution is advisable, the addition of salicylic acid proving too irritating.

Anæsthesia.—For superficial work a 1 per cent. solution proved satisfactory. Onset of anæsthesia is somewhat later than with 2 per cent. cocaine (our usual preparation), but the degree of anæsthesia ultimately obtained is the same. For deep anæsthesia a 5 per cent. solution was used; this appeared to produce an effect almost exactly the same as that given by 4 per cent. cocaine. The loss of sensation was in every case good, and the duration of anæsthesia was always sufficient for our purpose; but no special tests were employed to determine the latter.

Irritation.—The weaker solution (without preservative) is quite unirritating. The stronger is perhaps slightly irritating, but very little more than cocaine. No case of late irritation or damage to the epithelium was observed. On application there is definite injection of the conjunctiva; the addition of weak adrenalin controls this. Some drying of the cornea tends to occur, but this is less than that found with cocaine.

Pupil Changes.—The pupil is dilated by tutocaine. This occurs much more slowly than with cocaine, and is of less extent.

Toxicity.—No evidence was obtained of any toxic effect.

IV.—UROLOGY.

BY S. HARDY KINGSTON, M.B., CH.B. BRISTOL, D.P.H.,
DERMATOLOGIST, BRISTOL ROYAL INFIRMARY.

TUTOCAINE has been used for the anæsthetising of the urethra in upwards of 50 cases of chronic gonorrhœa, &c. A 1 per cent. solution, without adrenalin, was found suitable, and of this 10–20 minims were used for each examination.

Anæsthesia.—This came on within three minutes, and lasted on the average 15 minutes. It was in every case quite satisfactory. For diagnostic purposes it allowed clear view of such things as congested patches, ecchymoses, or submucous infiltrations of the mucous membrane. For therapeutic purposes the anæsthesia allowed treatment of the lesions with astonishing precision and efficiency, and was most useful in the therapy of chronic urethritis. Those patients who had previously been treated under novocaine (2 per cent.) assured me of their marked preference for the complete anæsthesia produced by tutocaine. In no case did this fail.

Irritation.—No case of primary or late irritation occurred.

Ischæmia.—Neither ischæmia nor injection was observed. The solution was used without adrenalin.

Toxicity.—No evidence was obtained of any toxic effect.

One fatal accident with tutocaine used for urethral anæsthesia has been published (O. A. Schwarz). A man of 20, apparently physically strong, but somewhat puffy, and psychically not quite normal, complained of asthma and kidney pains. For the purpose of cystoscopy, 8 c.cm. of 2 per cent. tutocaine was applied to the urethra without adrenalin. Ten minutes later a violent fit occurred, with pupil dilation and biting of tongue. Then complete

relaxation and "sleep." After a further 15 minutes another fit occurred. Again ten minutes unconsciousness, then clonic convulsions, respiratory embarrassment, cyanosis. Death occurred after 40 minutes from the application. Treatment had consisted in a caffein injection at the onset of symptoms. Autopsy: Status lymphaticus, thymus weighing 20 g. Death was undoubtedly due to poisoning. Schwarz considers that owing to the status lymphaticus, a dose which had always been harmless in others proved fatal in this case.

V.—DENTAL SURGERY.

BY L. E. CLAREMONT, M.R.C.S., L.R.C.P., L.D.S.,
SENIOR DENTAL SURGEON, BRISTOL GENERAL HOSPITAL, ETC.

FOR dental anæsthesia I have been using tutocaine in 0·5 per cent. solution without adrenalin. Up to 1·5 c.cm. of this has been employed at one time, the usual injection for a single tooth not exceeding 1 c.cm. Anæsthesia comes on within a few seconds; but for deep anæsthesia one must allow an interval of two minutes for the maxillary teeth, and five for the mandibular. The duration of anæsthesia is 20 minutes when the drug is used thus. In every case complete anæsthesia was obtained.

Side Effects.—No irritation or pain is caused on injection. In one case only was there some after-pain; this was in a case with exostosis of the roots, and it seems probable that the necessary forcible manipulation of the forceps might explain the late pain. No case occurred in which healing was delayed, or in which excessive bleeding was seen. No case showed any toxic symptoms. The results so far obtained are very encouraging.

A NEW OUTFIT FOR OXYGEN ADMINISTRATION.

BY H. WHITRIDGE DAVIES, M.B., B.S. ADELAIDE,
AND
A. RAE GILCHRIST, M.B., CH.B. EDIN.
(From the Department of Therapeutics, University of Edinburgh.)

EVER since its discovery by Lavoisier and by Priestley oxygen has been used for therapeutic purposes. The results, however, have been so disappointing that many clinicians have been disposed to dispense with it as useless. During and since the war, owing to intensive study of anoxæmia in aviators and in gassed men, and to the introduction of efficient methods for oxygen administration, most of the older misconceptions have been swept away and the gas has attained an assured place as a valuable and life-saving therapeutic agent. In this connexion the greatest credit is due to J. S. Haldane.

Indications for Oxygen.

Prompt and efficient oxygen administration is urgently demanded in all cases where the arterial blood leaving the lungs is deficient in oxygen saturation. This occurs in conditions where there is a lowered oxygen percentage or pressure in the inspired air and where, through bronchial obstruction or pulmonary lesions, the gaseous exchanges in the lungs are impaired. The most frequent pulmonary causes of anoxæmia are pneumonia and pulmonary œdema, and in the former it has been amply demonstrated by Meakins[1] that by efficient oxygen therapy it is possible to restore the arterial oxygen saturation to a normal level. Where the tissues lack oxygen owing to circulatory impairment the benefits from oxygen administration are less marked.

Apparatus for Administration.

Considerable need still exists for a simple, cheap, but efficient outfit for oxygen administration. The "tube-and-funnel" method as generally used is absolutely useless. Unless the funnel touches nose and chin and the gas is delivered at a very fast rate (not less than six litres per minute) little or no benefit can possibly be derived. The nasal tube method as described by Bourne[2] is little better except in infants. In both of these methods all the oxygen passing during the expiratory phase of respiration is entirely wasted.

The Haldane apparatus[3] gives excellent results in all but the severest degrees of oxygen-want. It gives an intermittent flow of oxygen, the gas being conserved during expiration, and for rates of oxygen flow of not more than half the subject's respiratory minute volume no better apparatus could be devised.

Our own outfit is essentially a modification of the Haldane apparatus. We have added to the latter a flow meter and a different type of valve, which provides in addition a means of moistening and warming the oxygen and of observing the flow of the gas. To the mask we have added an expiratory valve and an orifice of variable size for the admission of extra air. As an alternative to the mask we have introduced a forked nasal tube which can be used without loss of efficiency when the flow of oxygen is not more than a third of the respiratory minute volume. The general arrangement of the apparatus is shown diagrammatically in the figure. It consists of three parts: (1) cylinder and cylinder head attachment; (2) box containing flow meter, bag, and valve; (3) mask, and as an alternative a nasal tube.

The cylinder (A) may be of any suitable size, and the cylinder head attachment consists of a pressure gauge (B), a reducing valve (C), and a flow regulator (D). Oxygen is led through the flexible tube (E) to a box which can be hung on the back of the patient's bed. This box contains a flow meter (F), which indicates the rate of oxygen flow in litres per minute. From the flow meter oxygen passes to a bag (G) of about six litres capacity. During inspiration oxygen is drawn from the bag along the tube (H) through the wash bottle (I), which also acts as a valve. The bottle stands in an outer glass vessel (J), which can be filled with hot water. The box also contains compartments for storing the mask, nasal tubes, and cylinder head attachment. The tubes leading the oxygen from the bag (G) are of wide bore (½ inch) in order to allow of a free flow of oxygen. From (I) the oxygen passes along the tube (K) to a mask (L) or nasal tube (O). The mask is fitted with the usual pneumatic face-pad, and is attached by means of a broad band of elastic webbing. On the front of the mask are placed an expiratory valve (N) and an extra air orifice (M), which may be closed completely or opened to any desired extent. The forked nasal tube has two prongs, one of which is inserted into each nostril. It is held in position by an elastic forehead band. This has been devised as a useful alternative to the mask for patients in whom there is no nasal obstruction or who are unable to tolerate a mask. Where continuous oxygen therapy is indicated it affords a welcome change, for after an hour or so a mask may become somewhat annoying to the patient.

Method of Use.

The apparatus is used as follows. The cylinder head valve is freely opened and the regulating valve (D) so adjusted as to give an oxygen flow of 10 to 12 litres per minute. The extra air orifice (M) on the mask is completely closed, and when the bag (G) is moderately well filled the mask is applied to the patient's face. The patient is now breathing pure oxygen, and the rate of flow should be so adapted as exactly to equal his respiratory minute volume. This is done by observing the bag and the wash bottle. If the bag tends to empty itself completely the oxygen flow should be increased. If, on the other hand, the bag tends to overfill, and the bubbling through the valve to become continuous, the flow should be

[1] Meakins: Jour. of Path. and Bact., 1921, xxiv., 79.

[2] Bourne: THE LANCET, 1922, ii., 23.

[3] Haldane: Respiration, New Haven, 1922, p. 152.

diminished. After a little adjustment a mean is attained in which the bag neither over-fills nor completely empties, and the oxygen bubbles through only during inspiration. A reading of the flow meter at this point gives approximately the patient's minute volume of respiration which should be carefully noted. When this has been done the flow of oxygen is cut down to the amount slightly more than that sufficient to keep cyanosis in abeyance, the extra air orifice being opened to a sufficient degree. If the extra air orifice is too widely opened the oxygen

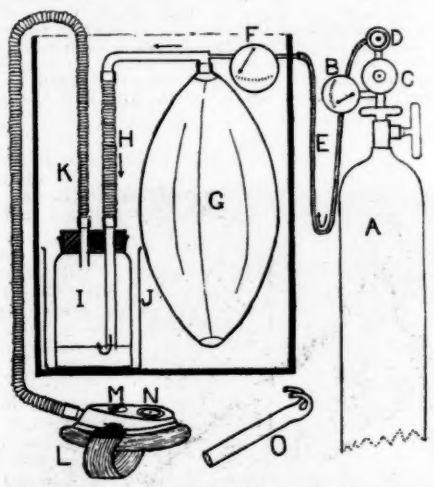


Diagram to show general arrangement of apparatus. (An explanation of the letters is given in the text.)

will tend to accumulate in the bag until it over-fills, and the oxygen will then pass in a slow and almost continuous stream. If insufficient extra air be allowed the bag will be sucked empty and the subject will then have to make an appreciable effort in order to obtain enough room air to complete each inspiratory act. The apparatus thus enables the physician to determine approximately the patient's respiratory minute volume and to adapt the oxygen flow to it. From the ratio between the two it is possible to calculate approximately the oxygen percentage in the alveolar air provided that no oxygen bubbles through the water valve during expiration, and that no leakage is present between the mask and the patient's face. Thus when the oxygen flow is equal to or greater than the respiratory minute volume and no extra air is admitted, the patient will be breathing pure oxygen, and the percentage of the gas in the alveolar air is approximately 94. When the oxygen flow is 2/3 of the respiratory minute volume the alveolar oxygen percentage is approximately 67. A ratio 1 : 2 gives 54 per cent. of oxygen in the alveolar air, 1 : 3 gives 41 per cent., and 1 : 4 gives 34 per cent. The alveolar oxygen percentage necessary to abolish the symptoms of anoxæmia affords an approximate quantitative index of the severity and extent of the pulmonary lesion.

We have made careful comparisons of the different methods of oxygen administration, and have found that the above method shows a high degree of efficiency at all ratios of oxygen flow to respiratory minute volume. We have found that the tube and funnel and nasal catheter methods are of little value and extremely wasteful. The Haldane method is highly efficient at low rates of oxygen flow, but wastes oxygen when the flow is more than half the respiratory minute volume. A full account of all this work is published elsewhere.[4] The apparatus described above is made by Messrs. Siebe Gorman and Co., Ltd., 187, Westminster Bridge-road, London. If so desired the tube (E) can be led to the box from a suitable liquid oxygen vaporiser instead of from the cylinder as depicted in our diagram.

[4] Davies and Gilchrist: Edin. Med. Jour., May, 1925.

Conclusion.

In conclusion we would plead for the more extensive use of oxygen in an *efficient* and *quantitative* manner, particularly in pneumonia and especially in the early stages of the disease. If anoxæmia be left unrelieved for more than a very few hours the results of oxygen therapy are frequently disappointing. Cyanosis should be forestalled, or at any rate abolished, by oxygen administration as soon as it becomes apparent. We have considerable clinical evidence that if this were done the mortality from pneumonia could be reduced, the severity of the symptoms markedly lessened, and a speedier termination of the infectious process assured.

We wish to express our indebtedness to Prof. Murray Lyon for his helpful criticism and advice in connexion with the preparation of this paper.

Clinical and Laboratory Notes.

TWO CASES OF DIPHTHERIA WITH UNCOMMON COMPLICATIONS.

BY J. TODESCO, M.D. FLORENCE, M.R.C.S., D.P.H. LOND.,
RESIDENT MEDICAL SUPERINTENDENT, CROYDON BOROUGH HOSPITAL.

IN the following two fatal cases of diphtheria the unusual nature of the complications renders them worthy of record.

CASE 1.—A woman, aged 50, unmarried, was admitted to hospital on Feb. 3rd, 1924, suffering from acute diphtheria affecting the nose and throat. She had been ill for two days. There was extensive ulceration of the throat, with sloughing membrane extending into the mouth, profuse purulent rhinorrhœa, the glands of the neck were exceedingly large and tender, with some difficulty of swallowing, and signs of acute bronchitis with much expectoration. The heart's action was regular with weak sounds. Temp. 101° F., pulse 120. Swabs from nose and throat showed many diphtheria bacilli. The throat conditions did not clear up readily, and the glands remained enlarged. On Feb. 13th the voice became nasal, the left side of palate was paralysed, with a perforation of palate on one side. There was some regurgitation of fluids, and, owing to increasing difficulty of swallowing, all feeding by mouth was stopped.

On March 10th patient vomited greenish fluid after a nasal feed. There appeared to be much post-nasal secretion, excessive salivation, and difficulty of expectoration, the palatal paralysis persisting. On the 14th the tongue, when protruded, was deflected to the left side, whilst the lower lip was drawn over to the right, her speech being very indistinct. On testing the lower limbs, the reflexes were absent, but there were no sensory or motor changes. Four days later the patient suddenly became very cyanosed and dyspnœic and vomited greenish fluid several times. Her pulse-rate increased rapidly to 160; it was small and weak; the temperature 100·2°. Signs of acute bronchitis were more marked, and she could not expectorate, though there was much secretion and excessive salivation. The paralysis of facial, twelfth, and vagus on left side was still apparent. From this time on her condition became worse. She appeared very distressed, and the pulse remained persistently weak and rapid. Death occurred suddenly on March 21st.

CASE 2.—A girl, aged 16, was admitted to hospital on Dec. 4th, 1924, with a history of sore-throat and shivering which had started six days previously. On examination she was flushed, had a "bull neck," and marked œdema of both upper and lower eyelids, so that the eyes could not be opened, and profuse semi-purulent discharge from both. The face was generally swollen, as well as the upper lip. There was profuse blood-stained rhinorrhœa with incrustation of nostrils which were blocked with membrane. Throat examination proved difficult, as the mouth could not be

easily opened. The fauces were very swollen and congested, with œdema of the posterior part of tongue and marked ulceration of palate. Sloughing membrane covered the whole of the pharynx and extended forward into the buccal cavity. On Dec. 15th the œdema of eyelids was less marked so that the eyes could be opened slightly; the discharge was more watery and straw-coloured. Both pupils were equal, reacting to light, and vision was normal. A culture taken on admission from throat, nose, and eyes was positive for diphtheria in each case. On the following day the œdema of eyelids had practically disappeared, the discharge ceased, but there was marked ecchymosis affecting eyelids, and extending down to malar bones and over the bridge of nose and forehead. Patient now showed signs of heart failure, and was cyanosed and restless at times. She felt cold and clammy, the heart's action being weak and irregular. She died suddenly on Dec. 17th. The temperature throughout ranged between 99° and 101° and towards the end many petechial spots were apparent on chest, neck, and limbs.

Commentary.

These two cases are interesting owing to the uncommon nature of their complications. As regards the first, paralysis of the hypoglossal nerve is extremely rare in diphtheria. It came on five weeks after the onset of disease, whilst the palatal paralysis started on the thirteenth day. The facial palsy was incomplete, apparently only affecting the mouth. As regards the second case, the eye condition was probably an instance of the interstitial form of conjunctivitis described by the late Dr. Claude Ker, in which, in addition to much œdema of the lids, there is profuse straw-coloured discharge. It is remarkable that in spite of the acute nature of the condition the corneæ were clear and vision was normal. Lastly, it is interesting to note that the eye swab culture gave a positive virulence test, proving that the eye condition was due to a virulent diphtheria organism and not a diphtheroid.

I am indebted to Dr. H. P. Newsholme, medical officer of health for Croydon, for permission to publish these cases.

A CASE OF TRUE DEXTROCARDIA.

BY NORMAN B. CAPON, M.D.LIVERP., M.R.C.P.LOND.,
HON. ASSISTANT PHYSICIAN, ROYAL SOUTHERN HOSPITAL, LIVERPOOL;
AND
E. NOBLE CHAMBERLAIN, M.D. LIVERP., M.R.C.P. LOND.,
HON. MEDICAL OFFICER, CARDIOGRAPHIC DEPARTMENT OF THE HOSPITAL.

INSTANCES of dextrocardia without transposition of other viscera are so rare as to warrant the publication of the following case.

The patient, a female child, aged 26 months, was admitted to the Royal Southern Hospital on Nov. 15th, 1923. She had recently been treated for broncho-pneumonia following whooping-cough.

On admission she was found to be seriously emaciated; temperature 102° F., pulse and respirations 148 and 54 respectively. The base of the left lung was very dull to percussion; inspiratory crepitations were audible over the same area, and the heart was displaced to the right. The left pleural cavity was explored with a needle on the day of admission, and again two days later. On neither occasion was fluid withdrawn. The temperature followed an irregular, intermittent course.

On the fourth day after admission the apex of the left upper lobe was also found to be dull to percussion; vocal resonance was increased and the breath sounds were bronchial in character. Over the right lung the percussion note was hyper-resonant.

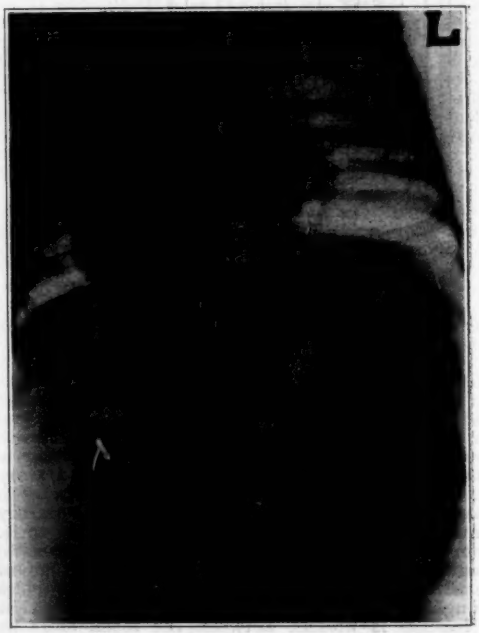
Gradual improvement, with resolution of the pneumonic zones, took place. Finally, only a chronic bronchitis of moderate degree remained, but the heart did not return from its abnormal position.

The child was sent away for convalescence to the Heswall Branch of the Royal Liverpool Children's Hospital, where she improved greatly under the care of Dr. C. J. Macalister. Later she was readmitted to the Royal Southern Hospital for further observation.

Her present condition is as follows: The patient is well-nourished and is rapidly developing, though she is still backward for her age. The lungs show no abnormal physical signs except those of residual chronic bronchitis. The apex-beat of the heart can be felt to the right of the mid-line, and the deep cardiac dullness extends 2¼ inches from the midsternal line in the fifth intercostal space of the right side. The cardiac rhythm is normal, and the heart sounds almost equal in duration and intensity; they are loudest at the apex-beat, where a short systolic bruit is audible from time to time. This murmur does not resemble a bruit due to congenital cardiac malformation. The systolic blood pressure is 70 mm. Hg. The liver is palpable on the right side of the abdomen. There are no physical signs of any deformities other than those stated above. Radiographic examination (see Fig. 1) confirms the dextrocardia and reveals a normally placed stomach and liver. There is no X ray evidence of delayed ossification of the bones of the hands.

Using the customary leads, the electrocardiogram shows inversion of P.R.T. in leads I. and II., with normal deflections in lead III. (see Fig. 2). If the leads from the right arm and left arm are interchanged, the resulting curves show normal deflections in leads I. and II., with inversion of all waves in lead III. (see Fig. 3).

FIG. 1.



Right-sided heart. The stomach, distended with bismuth meal, lies on the left side of the body.

Comments.

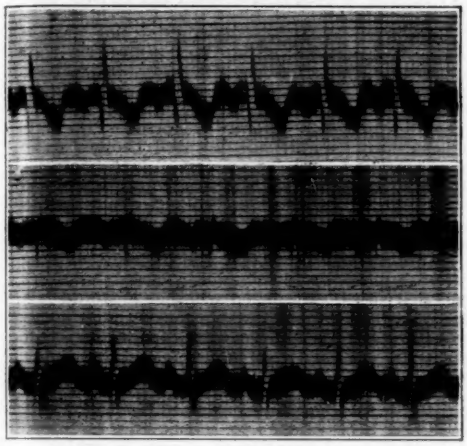
The following are important features of this case. First, the displacement of the heart to the right, together with signs of pneumonia in the left lung, pointed very suggestively, though wrongly, to the presence of fluid in the left pleural cavity. Second, the patient is an example of the very rare condition of true dextrocardia without transposition of the abdominal viscera. We can find only two cases published with electrocardiographic evidence—namely, those of Moffett and Neuhof,[1] and of Meyer.[2] Third, there is difficulty in explaining the inversion of P.R.T. in lead II. Willius[3] records a similar finding in a case

[1] Moffett, R. D., and Neuhof, S.: Amer. Jour. Dis. Child., 1915, x., 1.
[2] Meyer, P.: Archives des Maladies du Cœur, 1923, xvi., 249.
[3] Willius, Fredrick A.: Clinical Electrocardiography, Philadelphia and London, 1922, p. 142.

of dextrocardia, and attributes the inversion in lead II. to "an exaggeration of the inclination of the cardiac axis to the right."

Sir Thomas Lewis has very kindly examined our electrocardiograms, and considers that the inversion

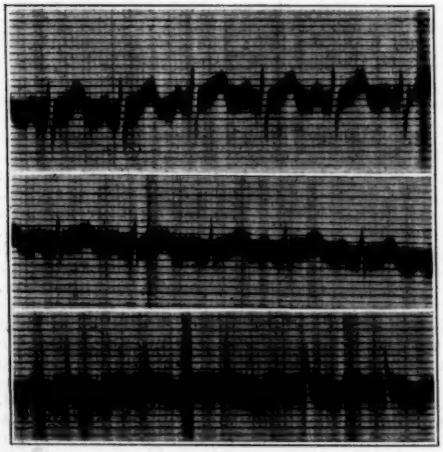
FIG. 2.



Inversion of all waves in leads I. and II.

of all waves in lead I. is due to true dextrocardia, but that the inversions in lead II. are due to bizarre deflections which are so often found in lead III. of apparently normal subjects; for, as he has pointed

FIG. 3.



Electrocardiogram taken with the right arm and left arm leads reversed. Inversion of P.R.T. in lead III. only.

out,[4] lead II. of an individual with dextrocardia corresponds with lead III. of a normal person.

In conclusion, we wish to thank Prof. John Hay for examining this patient with us, and for giving us the benefit of his valuable advice, and Dr. J. H. Mather for the radiographs.

[4] Lewis, Sir Thomas: Clinical Electrocardiography, London, 1924, p. 115.

Medical Societies.

BRITISH CONGRESS OF OBSTETRICS AND GYNÆCOLOGY.

PUERPERAL SEPSIS.

ON April 22nd and the two following days the Congress held a session at the rooms of the Royal Society of Medicine, under the presidency of Dr. H. RUSSELL ANDREWS. On the morning of Wednesday reports on the prognosis and treatment of puerperal sepsis, by a committee of the Section of the Royal Society of Medicine and by a committee of the North of England Obstetrical and Gynæcological Society, were submitted. Sir EWEN MACLEAN read a paper on puerperal sepsis in Wales, Dr. G. FITZGIBBON and Dr. J. W. BIGGER submitted one on a clinical and bacteriological investigation of puerperal fever, and Dr. L. P. LOCKHART spoke on bacteriological examinations during pregnancy. Sir Ewen Maclean's elaborate paper showed that Wales had a consistently high maternal mortality rate, higher than the combined figures for England and Wales. For England and Wales as a whole the death-rate from sepsis was lowest in rural districts and became higher as the urbanisation of the population increased. On the other hand, the "other causes" of death showed the opposite tendency—i.e., lowest in the urban districts. There was agreement as to the need in Wales of a larger supply of qualified midwives, more equably distributed.

The general discussion on the subject in the afternoon was opened by Prof. J. WHITRIDGE WILLIAMS, of Baltimore University, U.S.A. The chair was occupied by Dr. J. E. GEMMELL.

Prof. Williams said that as the London report showed a mortality of 35·8 per cent. in these cases, and the North of England report gave 76 per cent. mortality, it was clear that the latter included much more serious cases than the former. Adding the cases together they showed that 403 cases were treated, with a net mortality of 48 per cent.—i.e., one patient in every two with the condition died from it, a reasonably good result if they were all frank cases of the disease. Both reports brought out the facts that women who had been subjected to much manipulation and women who had had hæmorrhage were much more liable to infection than were others, though a certain number on whom there had not been manipulation died nevertheless. That it was a contact infection everyone now believed, and it would be a misfortune if that view were abandoned. A rapid pulse meant an ominous prognosis, and the higher and the more prolonged the temperature the more serious was the outlook. It was necessary to realise that there were two types of cases: one which would get well if left alone, another which would die whatever might be done. Both reports showed a mortality of some 80 per cent. in women who had been subjected to intra-uterine manipulations. He had taught for a long time that the worst thing that could be done was to interfere with the interior of an infected woman's uterus.

There was a marked difference in the two reports in the matter of the results following the use of anti-streptococcic serum. The London Committee stated that 33 cases were so treated with a mortality of 18 per cent., and in the North of England 104 cases, showing a mortality of 72 per cent. When one encountered a severe case of puerperal infection, anti-streptococcus serum seemed to be of no avail. Therefore all that could be done was to try to find some means of combating it. Two-thirds of patients with the thrombo-phlebitic form of pyæmia would die if left alone, and if operated upon they would probably all die. The less severe cases which did not come into these categories would recover if left alone, because the outcome depended on the degree of resistance of the patient and on the virulence of the

causative bacteria. Vigorous measures applied to these milder forms might convert a condition which was likely to be recovered from into one which might be fatal. There was need of research, not purely obstetrical, but along the general lines of bacteriotoxic methods.

Dealing with the communication of Dr. FitzGibbon and Dr. Bigger, in which they said they found streptococci in the vagina of two out of every three pregnant women, and in half the cases of puerperal conditions, and that the non-hæmolytic form was probably endogenous in origin, he said he did not think any technique employing a speculum for obtaining vaginal secretions was above suspicion. In ordinary women he did not think there were streptococci of any kind in these regions. Except in the cases of the gonococcus and certain saprophytic organisms, he thought it was a misfortune to talk about endogenous infection. To the end of December, 1924, out of 3000 consecutive admissions in his clinic there were 436 cases of rise of temperature in which it was necessary to consider the possibility of intra-uterine infection; 353 of them were puerperal infections—i.e., 11·7 per cent. Cultures were taken with the following results: *Streptococcus hæmolyticus* 32, non-hæmolytic 34, colon bacillus 13, gonococcus 23, staphylococcus 7, saprophytes 96, while 23 were sterile. This series did not include women who were brought after infection had occurred. In the series there were three deaths, and two of the women who died were brought after infection had occurred and were in labour; hence the responsibility for their death did not fall on the clinic. But one woman died who had hæmolytic streptococcus, whose vagina had not been examined, who had a spontaneous labour, and no perineal tear. In many of the cases which some would regard as endogenous in origin the women examined themselves, doubtless with dirty hands, and in some there was a history that there had been coitus during labour.

Prof. BLAIR BELL said that cases having a sudden onset of septicæmia and very little local resistance practically all died. But he did not agree with Prof. Whitridge Williams's passive attitude in these serious cases, as he, the speaker, thought there was a chance, chiefly with the aid of surgery, of saving their lives. Recently, in a patient who had general streptococcal peritonitis due to the hæmolyticus, also bronchopneumonia, all the treatment adopted was to drain the fluid from the abdominal cavity and treat her in the open air, and she recovered. It was only by starting investigations at the very beginning that light could be gained, especially in the prevention of the condition under discussion. Thousands of cases should be examined bacteriologically and their histories followed up. It had always been his view that coitus shortly before full time was a likely means of introducing streptococci into the vagina. Twenty per cent. of the cases in which this history was given showed the *Strept. hæmolyticus*. Digital examination before patients were admitted acted in a similar way.

Mr. VICTOR BONNEY argued that quite a large number of these cases were due to an endogenous cause—i.e., were auto-genetic. Despite the increasing attention paid to sources of outside infection and the assiduity of the teaching there had been very little fall in puerperal morbidity due to sepsis. It was at least significant that in 200 cases in one report the origin of the sepsis was not stated; he would have liked to see the compilers show a little more boldness and attribute them to intrinsic sepsis. At Chelsea Hospital, in 1900, the mortality for major abdominal operations was 5 to 6 per cent. In 1906 it had fallen to 1·6 per cent., and had since remained at about the same figure. The improvement synchronised with the use of gloves at operations; nothing else was changed; the personnel of the staff and the technique remained the same. Obviously those measures would not operate against intrinsic infection. Streptococcal vaginitis he considered to be very common, and in women in whom that was established it was a source of real danger.

Prof. H. BRIGGS said it was necessary to know what temperature constituted the onset of this condition. If the pyrexial period was taken as 24 hours after labour, was not the opportunity lost of producing a number of premature labours among these women? He thought the outcome of the discussion was that until in London there was a clinical equipment similar to that of the Rotunda in Dublin, with a 1·1 per 1000 mortality in septicæmia, there would not be any very great improvement.

Prof. BECKWITH WHITEHOUSE said he had learned two points of importance from the discussion: that puerperal sepsis depended largely upon two factors. The first was the amount of damage which had been done to the tissues; the second, the amount of hæmorrhage which had already occurred. Damage invited infection, hæmorrhage lowered the patient's resistance. Fifty of his cases were examined bacteriologically, and in only five of them were hæmolytic streptococci found in the cervix, and the patients went through a normal labour and puerperium. In only 12 of 500 cases did the temperature rise to conform to the standard laid down by the British Medical Association, and those 12 included a certain number of forceps deliveries. He asked whether it would not be possible, in the interests of the nation, to ensure that every woman should be examined at least in the eighth month of her pregnancy and have the combined attention of doctor and midwife. The latter could not be expected always to recognise abnormalities when they were present. He agreed with what had been said as to coitus as a factor in puerperal sepsis, and mentioned a case in which a husband admitted coitus within a fortnight of his wife's delivery.

Dr. F. J. MCCANN preferred the term puerperal genital infection, comparable to ordinary wound infection in general surgery. The main hope in treatment was antenatal care, for the subject was closely related to the housing question, as women could not be expected to give birth to a child in dirty and inadequate surroundings without becoming infected. Notification had proved a failure, and if it was to continue provision must be made for the sufferers in hospital. It was a blot that these women were admitted into fever hospitals. A badly infected case should never be left; the gynæcologist should stick to it to the last. In intense and foul toxæmia he found starvation of great value; it brought about a localisation of the pus, so that it could be drained away.

Dr. B. DAWSON (South Australia) said that Australia showed a higher mortality from causes associated with parturition than that of Great Britain; in 1922 the figure for the colony was 4·7 per 1000, as against Britain's 3·81. The death-rate from septic conditions was practically the same in both countries. In Australia there was nothing corresponding with Britain's Central Midwives Board, and only during the last two years had registration of nurses been operative. Women living in outlying farms under pioneer conditions had to endure, in childbirth, more than could well be imagined. In Australia there was a growing demand among the public for supervision during pregnancy. He made a plea, by request of his colleagues, for an Imperial, possibly an international, system whereby cases might be recorded on a uniform sheet, a standard means of case record. He also suggested that the bacteriological technique should be standardised, and that in certain well-defined clinical conditions the treatment should be uniform and should be revised and so controlled at periodic dates.

Dr. REMINGTON HOBBS said that a uterus in a state of sepsis was a contra-indication for exploration of its cavity. But it should be exposed to view in every case, and any products seen should be twisted off. Speaking of a series of 7000 cases of septic uterus, he said exploration was done only when there was severe hæmorrhage. He had frequently known a rise of temperature follow curetting and swabbing out with strong antiseptics, and after quite hot intra-uterine

irrigation. He had found that glycerine produced osmosis of the tissues, drained the cavity as well as the cervical canal, and greatly assisted involution of the uterus. It should be recognised that in this condition the uterus needed many treatments. If the uterus were drained the need would not arise to remove so many Fallopian tubes.

Colonel L. W. HARRISON reminded the Congress that Dr. T. H. C. Stevenson had pointed out the high incidence of puerperal mortality about nine months after the peak of the demobilisation curve. Dr. Stevenson asked the speaker whether there was likely to be any connexion between that fact and venereal infection. He suggested that the reason might be that large numbers of men infected their wives with gonorrhœa when they were demobilised, and that this disease was succeeded by a mixed infection of streptococci and staphylococci. He was sure many cases of so-called chronic gonorrhœa were those from which the gonococcus had long since disappeared and had been replaced by other micro-organisms, which would not have gained a footing but for the soil having been prepared for them by the gonococcal infection. Colonel Harrison gave reasons for believing that ophthalmia neonatorum was more likely to occur in the offspring if the infection of the woman occurred somewhat late in her gestation; whereas if she were infected early in the pregnancy, puerperal fever was the more likely sequel. As gonorrhœa was a mild disease in women compared with that in men, it was a good deal neglected in the former.

Dr. W. P. P. GORDON said that New Zealand had the lowest infantile mortality in the world and one of the highest maternal mortalities, and he asked whether the maternal statistics published were reliable as a guide to incidence rate of puerperal sepsis. In New Zealand puerperal morbidity had to be notified—i.e., every patient in hospital who had a temperature of over 100° F. for more than two days.

Dr. JAMES HENDRY spoke of cases in Paisley in which pyrexia did not occur until after birth. For all cases there was a morbidity incidence of 3 per cent. in the hospital.

Dr. C. E. DOUGLAS said that in his general practice of 44 years he had had 2200 cases and had operated on 557. He applied forceps in the second stage of labour whenever he thought it proper to do so. He had had only one death from sepsis. His patients were from a very healthy agricultural district. The factor which had been very little considered was the woman herself. It was not safe to assume that the woman about to have a baby was a healthy person; she might have tubercle bacilli in her system which would only reveal themselves in pregnancy. And the pregnant woman showed various abnormalities in comparison with the non-pregnant.

Prof. M. H. PHILLIPS gave his experience of these cases in the Monsall Hospital, Manchester, in which a block was set apart for puerperal fever cases. They had been treated by ordinary methods. Since the beginning of 1924, however, he had treated the cases of septic uterus by putting into the uterus glycerine, and the results had been very promising. Forty-five cases were so treated, and their average stay in hospital was 25·9 days, as compared with 39 days under treatment by rest, or by rest and sharp curettage. He exhibited comparative tables of his results.

Lady BARRETT spoke of the investigation of a series of cases of morbidity occurring in hospital, from the point of view of the source of the sepsis, and the best way of ending the sepsis in each case. There were two separate outbreaks of infection, which seemed to have different causes. In one it seemed to be due to the accoucheur, who had severe oral sepsis. Cases delivered by that person who were not on the morbidity list also showed some rise of temperature, but not up to 100° F. Probably their own resistance was effective against the infection. In the second series there seemed to have been nothing in common, except that each, during the first few days, had been in the same position in a particular ward. When this movement was stopped and no further admissions were allowed until the ward had been fumigated, no further cases occurred. The speaker showed how different people exhibited a very varying response to similar circumstances.

Mr. A. W. BOURNE said that the preventive aspect of the subject required that more bacteriological and serological work should be done. Twenty-five per cent. of the cases mentioned in one of the reports had no apparent ætiological factor. With regard to the other 75 per cent. of cases, the great need seemed to be more efficient teaching. Students and the profession generally could not be too insistently taught the enormous importance of antenatal examination and treatment, and the necessity for only the minimum intranatal interference.

Dr. T. WATTS EDEN said the profession had scarcely yet begun the systematic study of puerperal infection; it had not even settled whether, for the most part, the infection was intrinsic or extrinsic. Nor was the real significance of streptococci in the vagina known. Until hospitals provided special accommodation for puerperal sepsis cases, so that they could be investigated from beginning to end, there would not be much progress in the matter. There must first be real assistance from the Government. On the suggestion of Dr. Fletcher Shaw, he proposed that a memorial be sent from this Congress to the Ministry of Health urging the provision of hospital accommodation for the care and investigation of these cases.

This proposal was unanimously agreed to.

At the Thursday morning session the chair was occupied by Prof. B. P. WATSON.

Prolapsus Uteri.

Prof. W. W. CHIPMAN (Montreal) read a paper, which was illustrated on the epidiascope, on prolapsus uteri, describing the operation now being done for the condition in Montreal. He said that though no one operation would suit all cases, this method had satisfactorily stood the test for ten years. The condition was really a sacro-pubic hernia through the fibrous diaphragm of the true pelvic floor; it was a sliding hernia. The operation he described consisted in exposure of the fascial cleft, the replacement of the viscera, and the radical cure of the hernia. He regarded the operation as anatomically sound, and it was a simple one.

Mr. R. H. PARAMORE said he had not met with the masses of fibro-muscular tissue in the pelvis which Prof. Chipman described. During the last five years he had been doing an operation on the muscle floor of the pelvis only, which he described, and mentioned three cases in which he had carried it out.

Dr. G. FLETCHER SHAW said that if the perivascular tissue were thoroughly stitched in front of the cervix and a posterior colporrhaphy done there would be no fear of any recurrence. The operation was much more satisfactory when a good portion of the cervix was removed.

Dr. LEITH MURRAY said that in Newcastle the cervix was amputated for this condition in child-bearing women.

Prof. MUNRO KERR remarked that if the cervix were well dilated before doing amputation, stitching was rendered very much easier. The vagina should be thoroughly packed afterwards.

Mr. T. G. STEVENS spoke of the secondary hæmorrhage which was sometimes encountered about the seventh to the tenth day, usually due to the cutting through of the suture which turned in the mucous membrane to the cervical canal.

Dr. FITZGIBBON said one of the advantages of the operation was the conservation of vaginal mucous membrane, especially at the fornices. Unless there was marked hypertrophy of the cervix, it could usually be saved.

The After-Results of the Subperitoneal Gilliam Operation.

Dr. BETHEL SOLOMONS read a contribution on this subject. He said there were divergent views on the

treatment of backward displacement, and many symptoms followed upon it. 176 replies had been received from patients on whom the operation had been done more than a year ago. Four were absolutely cured of sciatica which had been intractable. Of the 107 who had had backache, 101 had relief, 6 were not benefited at all. Some who had had dysmenorrhœa were cured of it by the operation. 67 of the women had since had children at full term; only 3 had since had miscarriages. The main indications for operation were backache, sterility, dysmenorrhœa, and frequent abortions. Full anæsthesia was necessary, otherwise the rigidity of the recti impeded the operation. He was very favourably impressed by the results.

Prof. A. DONALD protested against these abdominal operations undertaken for retroversion, the frequency of which almost amounted to a scandal.

Prof. WATSON spoke of the difficulty of diagnosing the cause of this condition. One of the commonest was cervical laceration. A pessary should be applied in doubtful cases. Every means should be taken to eliminate the uterus as a possible cause.

Dr. WILFRED SHAW read a paper on the relationship between ovulation, corpus luteum formation, and menstruation, and Prof. MUNRO KERR one on a case of pseudomyxoma peritonei with affection of the appendix.

The chairman at the Thursday afternoon session was Prof. T. WILSON.

Premature Separation of the Placenta.

Prof. WHITRIDGE WILLIAMS gave a contribution on this subject. He said that in 9000 admissions to his clinic there were 57 cases of premature separation of the placenta and 64 cases of placenta prævia. He discussed specially 40 cases, from 15 to 43 years of age. Twelve were primiparæ. In 19 of the 40 cases the condition was mild, in 21 it was severe. Ten cases required Cæsarean section. There were 3 maternal deaths, 29 fœtal deaths, all in the Cæsarean section cases. Inflammatory changes in the decidua could be excluded, and syphilis played no part; in 37 of the 40 cases the Wassermann was negative. He admitted he did not know the cause of the condition. It had been stated that albuminuria played a marked part, but 15 of these patients showed no sign of albuminuria, either before or after the accident. On two of the women who died post-mortem examinations were done, and no sign of toxæmia was found. He agreed with a French authority that in cases of premature separation no special significance should be attached to an increased pulse-rate.

Prof. WATSON said he thought it would be agreed that the primary condition was hæmorrhage into the uterine wall, and the separation of the placenta was a mechanical result of that.

Treatment of Inoperable Carcinoma by Radium.

Papers on this subject were read by Dr. MALCOLM DONALDSON and by Dr. G. I. STRACHAN.

Dr. Donaldson said his object was to show the effect of radium treatment on the local condition. In the more recently treated cases with the longest duration of treatment, the growth disappeared in, on the average, five to six weeks, in the less advanced conditions the time taken for disappearance was even less. The method followed was to insert a number of needles (2 to 13) of 100 to 140 milligrammes of radium element, and the duration of application was eight hours. The results in these severe cases were such that it was important to have organised research on the subject. He pleaded for full reports of cases so treated, stating whether the actual salt or the gas emanation was used, the number of milligrammes, the applicators, and the time of application of the irradiation. He described his procedure in detail and exhibited full lists of his cases. In a general way, mild irradiation over a wide field for a long time he found best.

Dr. Strachan gave his results in 40 cases of carcinoma. In some the cervix had ceased to exist as a protrusion into the vault, and was represented by a bleeding ulcer, hence it was difficult to apply the radium. After the radium treatment there should be a douche every morning for three weeks, as it prevented the supervention of vaginitis. In the presence of vesico-vaginal fistula, radium was inadmissible, as acute cystitis was apt to be set up. Six weeks after radium had been applied there was evidence of increased fibrosis, and 11 weeks afterwards most of the cells were entirely degenerated. The reaction of carcinoma of the cervix to radium was good, but that of carcinoma of the vagina to it was not so good. In epithelioma of the vulva the result of the application of radium was bad.

Albuminurias of Pregnancy in New Zealand.

Dr. AGNES BENNETT read a paper entitled The Albuminurias of Pregnancy in the State Maternity Hospitals of New Zealand. It consisted of a plea for authoritative pronouncements on this subject for the guidance of all practitioners in the Empire, especially in the matter of treatment.

Toxæmias of Pregnancy.

Prof. LOUISE MCILROY read a contribution by herself and Dr. E. Pillman Williams on the toxæmias of pregnancy from their clinical and chemical aspects. The paper stated that the authors had not arrived at any definite explanation of the origin of the group of conditions dealt with, nor why one symptom or group of symptoms should declare themselves. In many it was difficult to say where physiological changes ended and pathological changes began. In many instances they considered that toxic conditions existed previous to the pregnancy, and that the chief sources of these toxins were in the intestine. The ovum was added to the toxic factory, and contributed its quota to the toxic state. In pregnancy there was an inability to cope with the toxins arising from defective excretion, coupled with toxins from the ovum, though the trophoblast was responsible for the generation of toxins rather than the fœtus. The main point was as to whether toxæmia was present, and if so, what was its severity? In many of the cases there was chronic intestinal stasis with distension of the colon over the region of the cæcum; in many there was a history of attacks of appendicitis. Toxæmia was more marked in primigravida than in multipara. There was a definite fall of nitrogen content in the blood throughout the whole gestation. Most of the cases of vomiting admitted to the wards showed signs of toxæmia; it was not a question of mere neurosis. Headache in some cases was found to be due to increased intracranial tension, and usually there were small rises in the blood-urea. If œdema occurred early in the pregnancy, the cause was to be found in deficient renal function. In cases which had vomiting, increased food gave better results than the induction of abortion. Only 3 of the 172 cases recorded had to have abortion induced; and in this series there was only one case of eclampsia.

At the concluding session on Friday morning the chair was occupied by Dr. LOUIS CASSIDY.

Endometrioma.

Prof. A. DONALD and Dr. K. V. BAILEY submitted the results of a clinical and pathological study of endometrioma, bringing out the chief points by epidiascope demonstrations. 108 cases were passed in review. Of 55 cases there were 35 women who had had no pregnancy for seven years. The most important symptom was dysmenorrhœa, which was present in 70 per cent. It was acquired in 55 per cent. of these. Menorrhagia was present in 57 per cent., leucorrhœa in 38 per cent., and backache in 28 per cent. Pain on defæcation and other rectal troubles were complained

of by some. Tarry cysts were found at operation in 77 per cent., and an adenomyoma in the recto-vaginal space in 63 per cent. A very important feature was that the rectum was adherent in 76 per cent., and there was need, the authors considered, for a careful investigation of the nature of the causal irritation.

The last contribution was a very elaborate one, supported by a wealth of photomicrographic slides, on the implantation of the human ovum, which was given by Prof. J. H. TEACHER, of Glasgow. He showed that fertilisation and implantation did not correspond to any part of the cycle in particular, but might occur at various points. There was not a long delay in fertilisation, but spermatozoa had a long viability. It seemed that rupture of the follicle nearly coincided with the insemination, and that fertilisation took place very shortly after that. Fertilisation had occurred within four or five days of the period being due, and as implantation did not occur for at least seven days—some declared it was ten days—it was not implantation of the ovum which stopped menstruation. That function was stopped, in his view, by fertilisation.

The thanks of the Congress were accorded Prof. Teacher for his demonstration.

During the Congress an instructive pathological exhibition was held under the control of Dr. Everard Williams. On Thursday members of the Congress dined together, and on Friday afternoon many operations were witnessed at a number of London hospitals.

Resolution.

On Wednesday the Congress agreed unanimously to the principle of a resolution to go to the Ministry of Health. On Friday the exact terms were approved, also unanimously, as follows :—

"In the opinion of the British Congress of Obstetrics and Gynæcology, the most urgent requirement in connexion with the problem of sepsis is the provision of adequate accommodation for the reception and treatment of these cases in hospitals, supervised, wherever possible, by obstetric surgeons."

ROYAL SOCIETY OF MEDICINE.

SECTION OF UROLOGY.

A MEETING of this Section was held on April 23rd, Mr. CYRIL NITCH, the President, being in the chair. A discussion on

Bacterial Infections of the Urinary Tract

was opened by Prof. LEONARD DUDGEON, who confined his remarks to a few of the types of infection that might be encountered. (1) A special group of hæmolytic bacilli, isolated by himself, of which he had met many hundreds of cases. The condition and the bacillus strongly resembled that of paratyphoid at first sight. In a certain number of cases it had been possible to recognise the same organism, by serological tests, in the intestinal tract of patients suffering from urinary infection. The course of the infection differed markedly from that due to *B. coli* in the short acute course lasting for two or three weeks and then clearing up completely. If relapses occurred they were short. Patients suffering from this infection were more sensitive to vaccines than any others, and vaccine treatment produced immediate rise of temperature and return of severe clinical manifestations. Vaccine should never be given until the temperature had been normal for several days, and most cases recovered satisfactorily without it. (2) *B. coli.* Two strains of this bacillus were encountered—a hæmolytic variety, which accounted for 70 per cent. of cases in the male and 30 per cent. in the female, and a non-hæmolytic variety for which the sex percentages were exactly reversed. It was easy to immunise rabbits with the former but very difficult with the latter. The vast majority of colon bacilli were non-hæmolytic; the other kind was met with in certain cases of severe diarrhœa. It had long been believed that the intestinal canal was the origin of *B. coli* infections of other parts, and he had been able to prove this experimentally in a certain number of urinary cases. Treatment by vaccines was not satisfactory; it was very difficult to produce any degree of immune substances in the blood. An autogenous vaccine should be used, because of the two types; the hæmolytic type was more likely to be benefited by vaccines. If there was hypersensitivity to vaccine the dose should not be pushed or severe tissue damage might result. Animal experiments showed that if *B. coli* was held up in any part of the body it produced a suppurative lesion, as, for instance, if injected into serous sacs. In chronic cases it had been proved that coli abscesses were present in the kidney in those instances where the administration of vaccine caused rise of temperature. In those instances where he had investigated second attacks he had found that the organism was always identical with that causing the first attack. He therefore concluded that it had lain dormant somewhere in the urinary tract, although the urine might have cleared up completely. (3) *B. proteus.* Although some people regarded this as a non-pathogenic organism it might lead to the most acute infection, with the bacillus recoverable from the intestine and blood-stream. The urine in such cases was alkaline, containing a great deal of mucus, triple phosphates, and pus. A vaccine might be given when the acute stage was over and was sometimes successful. (4) *Staphylococcus albus.* The presence of this coccus in large numbers with pus in the urine was, in his experience, invariably associated with the existence of a calculus.

Dr. E. LEPPER described experimental work on the production of lesions in the kidney in rabbits by *B. coli*, in an attempt to account for the fact that intravenous injection of the organisms rarely caused serious damage unless there was coincident obstruction to the flow of urine. Compression of the ureter for 55 minutes resulted in necrosis of the cortex with multiple small abscesses, distension of the tubules, and inflammatory reaction. Even so short a compression as 15 minutes produced marked abscess formation, and if the animal were examined immediately, the pelvis was found to be distended with blood-stained urine and the renal vessels much dilated. The effect of the obstruction appeared to be produced by back pressure; the urine, being secreted and unable to escape, caused such distension of the veins that rupture occurred with extravasation of blood, containing bacteria, into the kidney substance. If no urine were secreted during the time of the experiment none of these results occurred. Injection of bacilli with no obstruction led to naked-eye lesions in 8 cases out of 50 only, with microscopic abscesses in 20 more. The process appeared to be one of bacterial embolism, setting up focal abscesses which might rupture into the tubules or on to the surface of the papilla and occasionally might cause infection of the whole pelvis. There was no known reason why the vessels of the papilla were more liable to embolism than those of the cortex.

Sir JOHN THOMSON-WALKER dealt with the diagnostic and therapeutic aspect of the problem, confining himself to those instances in which there had been no previous disease of the kidney. The acute case was ushered in by four or five days of prodromal symptoms, insufficient to cause the patient to seek advice. These took the form of irritability, loss of appetite, hypersensitivity to heat and cold, a little frequency of micturition, a little more flatulence or constipation or relaxation of the bowels than was usual. Then the attack began suddenly with frequency of micturition, in all degrees of urgency up to strangury. After a few hours there was rigor and rise of temperature. The urine was passed in

small quantities, was cloudy, offensive, and might contain a little blood. There was distension of the bowel and constipation. More localising symptoms followed, generalised abdominal pain finally settling in the loin, sometimes taking the form of renal colic. A little rigidity and tenderness might be felt and a little enlargement of the kidney. If the condition was passing on to one of pyonephrosis there would be a swinging of the temperature, the local symptoms would be more severe, and the urine would become clear. But there might instead be difficulty in passing water, going on to retention, or pain, a sense of weight, and aching in the rectum with enlargement and tenderness of the prostate or distension of the vesiculæ seminales. Or localising symptoms might be entirely absent. The attack might last 14 or 21 days or drag on up to two or three months. Often there were exacerbations or recurrence of symptoms after complete subsidence. Uncommon symptoms were: (1) High temperature without other phenomenon. (2) Pain as the principal feature, either aching or severe in nature; such cases were liable to be diagnosed as appendicitis. (3) Renal colic, which might be just as acute with a descending ureteritis as with a descending stone. (4) Hæmaturia as the first symptom. In such a case the infective nature of the condition might be recognisable by the characteristic *B. coli* odour of the urine. (5) A sterile urine associated with a suppurative cortical nephritis. There would be high temperature, but few local symptoms, save an enlargement of the kidney due to perinephritis which might pass on to perinephritic abscess. The cause was usually the staphylococcus, and a history of boils or other staphylococcal skin infection could usually be traced. Of the chronic types Sir John Thomson-Walker considered three: (1) Recurrent pyelitis and cystitis. Of this variety there were two types, the acute attack which subsided but was followed six months or a year later by another and that by yet another. Between the attacks there were no symptoms save possibly a little irritability of micturition and slight rise of temperature. In the second type the infection recurred and the urine was sterile between the attacks. Some of these must be genuine reinfections; some were undoubtedly cases of infection of the seminal vesicles, but in the female it was difficult to see where the bacilli might lie dormant. (2) Chronic cystitis with quiescent pyelitis. These cases were very difficult as the ureteric catheter alone would show the real source of the trouble. The pyelitis might give rise to no symptoms at all. Out of 100 cases of cystitis taken at random, 42 had sterile kidney-urine, while the remainder had infection of the kidney. (3) Bacilluria without local symptoms. In many cases this was connected with chronic toxæmia, fibrositis, aches and pains, and stiff joints; many of the milder cases were classed as neurasthenia.

Treatment.

Certain prophylactic measures might be taken against infection from the bowel. The normal barriers preventing the passage of bacteria seemed to be an intact epithelium, with its mucous covering, the lymph nodes in the intestinal wall, and the glands along the colic vessels. An acute bacilluria might follow drastic purgation or Plombières treatment. Prolonged exposure to X rays and radium facilitated the passage of bacteria through the bowel wall, and possibly the removal of the normal appendix might do so also. Operations on the bowel should always be accompanied by the administration of urinary antiseptics. The antiseptics in use were salol, boric, and hexamine. It took some time to split hexamine in contact with an acid urine and the drug was excreted unchanged in cases where there was frequency of micturition. Moreover, the acutely inflamed bladder was unable to contain a very acid urine and the acidity must be limited. In cases with an acid urine Sir John Thomson-Walker had given up the use of hexamine and merely tried to soothe the bladder. The only antiseptic which could be used in an alkaline urine was methylene-blue, which was very mild. The intravenous injection of mercurochrome and methyl-violet, tried in America, had not fulfilled expectations. Lavage of the renal pelvis was the only cure in some cases, but they must be very carefully selected; cases of infection of the prostate or seminal vesicle or of obstruction of the lower urinary tract must be excluded, except in the pyelitis of pregnancy where the lavage seemed to help the condition. It was best in cases of persistent pyelitis.

Discussion and Reply.

Dr. FOWLER WARD asked Prof. Dudgeon how to distinguish between the two types of infection clinically in order to decide whether to give vaccine treatment or not.

Dr. J. A. ANDREWS mentioned the teeth and tonsils as sources of infection. Certain American experimenters had created cavities in the teeth of dogs and filled them with bacteria from the urine of patients and had succeeded in producing kidney lesions in a large percentage of cases.

Dr. OLIVER HEATH described a personal experience of cystitis from which he had attempted to determine the meaning of the symptoms experienced. The frequency of micturition was nature's way of producing frequent muscular contractions, with inflow of fresh blood, bearing antibodies, and of flushing out the bladder. He had found that the discomfort could be reduced to a minimum by drinking water in excess, while the withholding of fluid rapidly produced strangury. Treatment should be based on the sensations experienced as a guide to the *vis medicatrix naturæ*.

Mr. S. G. MACDONALD regarded acute infections by the *B. proteus* as rare; they were more usually a terminal stage in old stricture cases. He agreed as to the association of calculus with staphylococcal infection. A very important group not yet mentioned were the cases with sterile urine due to renal blockage. In his opinion surgical interference was only justified when there was this definite and persistent block. He asked where the splitting of hexamine took place as it did not seem to occur with a damaged kidney.

Mr. H. EVERIDGE inquired whether the estimation of the cholesterol content of the blood had any practical value in assessing the degree of infection.

Mr. GRANVILLE HEY described the case of a primipara three months' pregnant, who had no symptoms save a slight aching in the left loin and cloudy urine. A *B. coli* bacilluria was found associated with a calculus in the left kidney which was successfully removed. Certain American observers had demonstrated a direct continuity between the lymphatics of the right kidney and those of the ascending colon.

The PRESIDENT described a case of granuloma of the bowel with cystitis which had been completely cured by the intravenous injection of electrargol. Chronic *B. proteus* infections, in his experience, did well with vaccine treatment but the acute ones did not.

Prof. DUDGEON, in reply, said that the examination of a loopful of urine was insufficient; at least 10 c.cm. must be investigated before it was said to be sterile.

Sir JOHN THOMSON-WALKER, in reply, agreed that diuresis should always be employed as a method of treatment. He described a case of typhoid bacilluria cleared up by removal of a stone. The splitting of hexamine usually took place in the bladder, but it was a matter of time. The poor results obtained by its use in cases of enlarged prostate were due to the diuresis and great dilution of the urine, so that it is impossible to get a sufficiently high acidity for splitting, and to the condition of chronic interstitial nephritis, due to back pressure, so that less hexamine was excreted. Lavage would cure a certain percentage of cases, but might fail because the patient would not come long enough or regularly enough, or owing to the use of an insufficiently strong antiseptic, or the presence of a slight obstruction or small stone or pelvic dilatation. The worst type of case was a

mixed infection with *B. coli* and *B. proteus*. Alkaline treatment encouraged the *B. proteus* while acids encouraged *B. coli*. If the patient happened to get an unconnected tonsil or throat infection the kidney condition became much worse at once, though the reason for this was not known.

MEDICAL SOCIETY FOR THE STUDY OF VENEREAL DISEASES.

A MEETING of this Society was held in the rooms of the Medical Society of London on April 24th, Colonel L. W. HARRISON, the President, being in the chair.

TOXIC EFFECTS OF ARSENOBENZOL TREATMENT.

Mr. DAVID LEES opened a discussion on the toxic effects of arsenobenzol treatment and their prevention. He said that these toxic effects, both after intravenous and intramuscular injection, were produced in many ways, and many factors entered into consideration. The chief determining factors were the health of the patient prior to administration, the preparation of the patient, the drug used, the method of preparing it in solution, and the technique of administration. Physical exertion on the part of the patient, especially just before or after administration, might play a part in some of the reactions that were observed. The daily regulation of the bowels, again, was essential. With regard to the drugs, the "606" group were more toxic in general than the "914," and in the case of "606" it was very necessary to be careful and slow in administration. Indeed, in all the drugs given for the treatment of syphilis this slowness in administration was an important factor. He was a strong believer in dilute solutions, and he believed also in filtration. There was no doubt that any undissolved particles would open the way to accidents, which might be avoided by using completely soluble preparations. In a great many patients psychic reactions occurred at the first administration; they could be overcome usually by careful technique and by having the patient in the lying posture. The fact that the beginning of the injection caused pain to the patient might set up fainting and other minor reactions. Some patients, no matter what precautions were taken, would react adversely to either intravenous or intramuscular injections of arsenic. He discussed the various reactions, first those which occurred immediately on or after administration or within the first 24 hours, and then those which occurred later, up to a period of months. In the immediate reactions were included headache, vomiting, and diarrhœa. It was probable that more than one cause was present in the acute reactions which occurred after treatment with arsenobenzol. In his own experience, with care in the preparation of the drug, and especially in the dissolving of the drug, its filtration before use, and its slowness in administration, the incidence of the immediate reactions, both minor and major, was exceedingly small. Occasionally a sensitive patient was encountered and it was necessary to consider what steps should be taken to safeguard him. Mr. Lees found that with atropine desensitisation there was less likelihood of the patient having cardiovascular upset than with adrenalin. Of the reactions which occurred within 24 hours, skin eruptions, such as herpes and urticaria, were of little importance except as danger-signals. Special care should be taken to watch the kidneys of such patients. He spoke of vasomotor disturbances and gave particulars of cases.

With regard to later reactions, albuminuria often presented considerable difficulty. Was the albuminuria due to drug therapy or to syphilis? Only by waiting and watching could one possibly decide. One of the most interesting reactions was a gross exfoliating dermatitis. There were certain individuals who had a special idiosyncrasy of the skin to therapeutic irritants, and these showed undoubtedly a greater tendency to such a condition. From the experience of the past ten years he could not agree with the observation that the joint exhibition of arsenical and mercurial therapy predisposed to the onset of dermatitis. There was no actual proof that the dermatitis was due to over-excitation of the tissues by metallic arsenic, as suggested by McDonagh, and one was left to assume that it was due to hypersensibility to arsenic on the part of the patient. Patients made a slow and uninterrupted recovery unless complications set in. Of the complications the most dangerous was broncho-pneumonia, while others were peripheral neuritis and jaundice. If these complications could be avoided the prognosis was good. The drug most useful in the treatment of this condition was one of the sulphur compounds. In arsenical dermatitis the Wassermann test frequently became negative and might remain negative for a considerable time. Some workers had stated that such a patient never again showed any manifestation of syphilis, but this he believed to be very dangerous teaching. With regard to jaundice, many considered that this was due to the toxic action of arsenobenzol on the liver tissues. The predisposing factors were constipation and intestinal toxæmia. A very considerable number of the mild cases of jaundice one met with were not due to the salvarsan, although that might be a contributory factor, irritating, as it did, the mucous surface of the intestinal canal. It was a small matter for the inflammation to extend from the bowel through the biliary tract and set up a liver condition. In other words, salvarsan was more likely to injure the liver in a person infected with syphilis who, in addition, had an intestinal toxæmia and a possible predisposition to catarrhal jaundice. For treatment, rest in bed, evacuation of the bowels, and careful dieting were necessary, also the administration of alkalies in association with salicylate of soda, glucose given intravenously, and a diet rich in glucose. As a routine procedure he had recently been giving 50 c.cm. of glucose by the mouth to every patient half an hour before treatment with arsenic. This fortified the liver against the arsenic action, and he had had very few cases of catarrhal jaundice.

In conclusion, he emphasised the great necessity of careful preparation of the patient for administration and careful examination, especially of the urine, prior to administration. Next he emphasised care in dosage and in the technique of administration. Alcohol must be avoided throughout the whole course of the treatment. As to the amount and frequency of the drug, moderate doses should be given with a safe interval (one week), the average course of injections extending over eight weeks and the intervals of rest eight to ten weeks. Except in the early stage of the disease, heroic therapy by massive doses was not of so much value as moderate, safe, and prolonged dosage. Intramuscular administration was to be preferred to intravenous, especially in the later stages.

Dr. J. C. BUCKLEY said that in his clinic for the first two years, while the novarsenobenzol was of the old "Rochester Row pattern" not a single case of jaundice occurred, but during the last five years he had seen about 120 cases of jaundice, all of them very mild, except one, which proved fatal, the patient dying four and a half months after the administration of the drug. Of these 120 cases about 20 occurred among patients who had been put down as provisionally cured, having had a negative Wassermann for two years, and coming up every six months or so for a provocative dose or a test. As to dermatitis, the worst case he ever saw was long before "606" was introduced.

Dr. T. ANWYL DAVIES thought the most important lesson to be gathered was that the prophylactic against arsenical intoxication was intramuscular administration. In addition this had greater therapeutic value, and undoubtedly brought about a negative Wassermann sooner than did any other form of administration.

Dr. FOWLER WARD said that he had had formerly a good many cases of stomatitis, but now he made a

practice the first week of giving arsenic and the second week of giving mercury intramuscularly with the arsenic, and since then very few cases of stomatitis had occurred.

DR. D. N. NABARRO did not think that the psychic effect could be attributed to the drug itself. He found at Great Ormond-street that the same children week after week were sick after injections, and one nervous child used regularly to vomit before the injection was started. Recently he had been treating an adult case who had malaise and nausea after each intravenous injection of arsenic; he tried intramuscular injection of bismuth, and the patient stated that he had the same symptoms. Vasomotor disturbances were very rare in children, and when they did occur he thought they were due to too big a dose for the size of the child. Jaundice was also very rare among children. Some years ago he had one case of dermatitis occurring after a fourth injection of novarsenobenzol; the rash appeared on the first or second day after injection. Unfortunately, the child was not brought directly back to the hospital, but was taken first to an outside doctor. When later it came to the hospital the rash looked exactly like measles. The child was taken into a special observation ward and died.

DR. H. C. SEMON had had one case of dermatitis, but never a case of jaundice. He was surprised that for the treatment of jaundice Mr. Lees did not suggest thiosulphate of soda; he had himself found that drug valuable.

DR. C. H. MILLS said that in the earlier days of "606" patients were prepared as for a major operation and were starved. This course had been proved to be erroneous, and now patients were not starved; they were told to avoid physical exertion and the use of alcohol, and constipation was corrected. What was still wanted was some reliable test which could be applied in the out-patient department for the detection of intolerance.

THE PRESIDENT said that he had previously ventured the opinion that the use of thiosulphate as a prophylactic might interfere with the therapeutic action of the remedy, but he now desired as the result of further work and consultation to retract that opinion. He also emphasised the effect of cold in increasing the predisposition to dermatitis.

MR. LEES, in reply, urged that it was a very sound procedure to filter the solution in intramuscular therapy; it made for less pain and discomfort. He said it was more desirable to bring the patient's general health up to the highest possible level than to fill him up with salvarsan or its substitutes.

Clinical Cases.

DR. H. M. HANSCHELL showed two clinical cases. The first was a Chinese seaman with ulcerating granuloma of the penis. The other was a European, about 30 years of age, who, four and a half months previously, had primary syphiloma on the prepuce, and the *Sp. pallida* was found. The Wassermann test was doubly positive; there were no secondary symptoms. After five intravenous injections at weekly intervals of stabilarsan, totalling 2·7 g., and five weekly injections of bismuth in glucose suspension, totalling 1 g., he developed severe purpura covering the trunk like a bright purple jersey. The liver became enlarged 3½ in. below the costal margin, the spleen 2 in. below. There was no fever or malaise, and the patient insisted on continuing his work, which was that of a carman. There was no albuminuria or glycosuria, and the Wassermann was still doubly positive. Treatment was suspended. A week previously he developed jaundice. The urine was of deep orange colour, there was no bile, no albuminuria, no glycosuria, the liver was not tender (though it was still 3 in. below the costal margin), the spleen was not palpable. The purpuric area was now staining brown. When first seen four and a half months previously there were abdominal pains. On palpation of the abdomen at that time no enlargement of liver or spleen was detected.

BRISTOL MEDICO-CHIRURGICAL SOCIETY.

A MEETING of this Society was held at the University, Bristol, on April 8th, DR. J. O. SYMES, the President, in the chair, when MR. A. RENDLE SHORT read a paper on

Diagnosis of the Dyspepsias.

His observations were based on a series of 100 cases of non-malignant dyspepsia, all studied on a definite plan, all verified by operation, and mostly followed subsequently. The growth of accuracy in the diagnosis of dyspepsia was due to: (*a*) Better knowledge of physiology; (*b*) disregard of hæmatemesis as a diagnostic point; (*c*) watching the movements of the bowel by means of X ray screen; and (*d*) better classification. Knowledge of physiology had grown in several ways. It was now known that both the hypersthenic and the hypotonic types of stomach might exist in perfectly normal persons. In the former, the viscus emptied quickly; such persons were apt to have an excess of acid, and were "hungry folk." On the other hand, achlorhydria was not necessarily a sign of disease, any more than was visceroptosis. Again, we now knew that nervous reflex mechanism controlled the sphincters of the alimentary canal, so that delay in any one part might upset matters all along the line, and produce symptoms referred to a region distant from the actual site of the disease. Thirdly, minute lymph nodules were found especially along the lesser curvature of the stomach; these might ulcerate and bleed. Hæmatemesis might be the only symptom of disease, or there might be dyspepsia due to causes outside the stomach and duodenum, accompanied by dangerous bleeding, or finally there might be bleeding from a chronic ulcer. In the series, 1 in 3 of the gastric and duodenal ulcers were accompanied by bleeding, and 1 in 6 of the cases of appendicular dyspepsia. Mr. Short said that he classified dyspepsia as (1) functional, (2) organic, or (3) reflex. Functional did not mean hysterical, but disturbance of function, as with acute and chronic gastritis of alcoholism, dyspepsia of phthisis, anæmia, anorexia nervosa, and so forth—all these were the province of the physician. The reflex dyspepsias were (*a*) gall-bladder dyspepsia—flatulence and vomiting prominent, the vomiting coming especially after certain foods, alkalies did not help, there was often some gastric delay; (*b*) appendix dyspepsia, pain is usually not very severe, was *continuous*, but worse after food—often vomit without relief of pain; (*c*) undiagnosable reflex dyspepsia—pain and vomiting were not related to each other or to food.

Organic disease of the stomach or duodenum might give rise to several types of dyspepsia: (A) *Gastric ulcer.* These cases tended to show a definite sequence, thus—food, relief, pain, vomiting, relief. The relief following a meal tended to be rather over half an hour. The pain was severe and vomiting the rule. A test-meal was useless in diagnosis, but X rays might give great help. If later pain became continuous and was felt in the back, pancreatic involvement might be suspected. (B) *Duodenal ulcer.* Vomiting was less common, only half the cases showing it. Relief obtained by food lasted usually over an hour. The pain was severe. Test-meal was of little service, though hyperchlorhydria was the rule, but deformation of the skiagraphic duodenal cap was characteristic when seen. The stomach usually emptied rapidly, but this was a cause rather than a consequence of the ulcer. (C) *Duodenal ileus* might occur by itself or be a symptom of other disease. Flatulence and nausea were marked, vomiting was common, pain was not severe, and the relation to food was obscure. The skiagram might be definite, showing great delay and distension of the second and third parts of the duodenum; duodeno-jejunostomy brought about a cure. (D) *Periduodenal adhesions* might give rise to bad pain, even after taking water. Vomiting was usual, bleeding absent. The X rays

showed gastric delay. (E) *Gastric cancer* was accompanied by great loss of appetite. Pain might be continuous. A test-meal might show nothing, but X rays might reveal a typical deformity. (F) *Pyloric stenosis*, hour-glass stomach, or leather-bottle stomach might account for dyspepsia. Mr. Short showed a number of skiagrams illustrative of his paper.

Discussion.

The PRESIDENT appeared to think that a better title would have been "Diagnosis of Surgical Dyspepsia"; only a small proportion of dyspepsia was amenable to surgery. A great proportion was due to worry. He viewed with distrust cases called appendicular dyspepsia. But he agreed with Mr. Short as to the anorexia of gastric cancer, and the small value of a test-meal.

Mr. C. A. MOORE asked what were the symptoms and pathology of duodenal ileus. He thought deformity of the duodenal "cap" rare. He related a case illustrative of the great difficulty of diagnosing gall-stone from duodenal ulcer. He agreed with Mr. Short that an atrophic appendix might be the cause of dyspepsia, and also that the dyspepsia might be accompanied by hæmatemesis.

Dr. D. A. ALEXANDER spoke of the value of long-kept records in diagnosis of dyspepsia, and instanced in this connexion cases of tuberculous adhesions.

Mr. A. W. ADAMS agreed with Mr. Short's observation as to duodenal ileus. He found this condition in one case diagnosed chronic appendicitis. He suggested that this condition might be associated with those cases of acute post-operative gastric dilatation, the mesenteric vessels being responsible.

Mr. SHORT, in reply, said that though duodenal ileus was difficult to diagnose before operation, in a typical case this was possible. He was glad others agreed that dyspepsia and hæmatemesis occurred as symptoms of appendicitis.

Diagnosis of Nasal Sinus Disease.

Dr. P. WATSON-WILLIAMS read a note on some points in the diagnosis of nasal sinus disease. He showed by what means, using the suction-syringe method of sinus exploration, it was possible to differentiate between cells. Especially might this become important when one sphenoidal sinus was very large and the other small; the large sinus might be entered from the opposite side of the nose in mistake for the sinus of that side, and the latter thus overlooked. In certain cases, notably those with involvement of vision, this might lead to serious errors in the diagnosis. The point was illustrated by a collection of lantern slides.

GLASGOW ROYAL MEDICO-CHIRURGICAL SOCIETY.

AT a recent meeting of this Society, Prof. ARCH. YOUNG, the President, in the chair, Dr. IAN STRUTHERS STEWART (Nordrach-on-Dee) spoke on some points in the

Diagnosis and Prognosis of Pulmonary Tuberculosis.

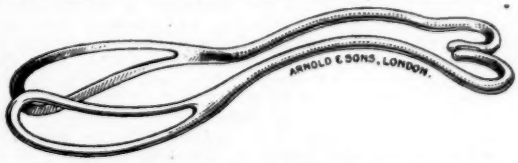
Dr. Stewart referred briefly to the pathology in relation to the infection and subsequent spread of the disease. The infection was at first one of the lymphatic system, and in the less acute cases the route might be through the tonsil to the cervical, mediastinal, bronchial glands, and thence by way of the peri-bronchial lymphatics of the larger bronchi to the lung, the sub-pleural lymphatics, and the visceral pleura. The inflammatory changes which took place in the bronchial wall as a result of the infection of the peri-bronchial lymphatics might be followed by caseation and ulceration into the lumen of the bronchus and infection of the lung, or by blocking of the lumen with subsequent collapse of the lung area supplied—a condition which favoured the further spread of the disease. Referring to the comparative frequency of the early signs and symptoms, Dr. Stewart gave the following percentages of frequency as a result of an analysis of 200 consecutive cases: Cough, 60; lassitude, 48; pyrexia, 42; hæmoptysis, 27·5; pleurisy, 24·5; loss of weight, 12; loss of voice, 8; night-sweating, 7; dyspepsia, 3·5; neurasthenia, 1. The grouping of these into toxæmic and localising symptoms served to emphasise the fact that the toxæmic symptoms—lassitude, pyrexia, loss of weight, night-sweating, indigestion, and neurasthenia—might appear before any physical signs could be detected. The importance of accurate observation of the temperature was urged and several illustrative charts were shown. The speaker went on to co-relate the signs and symptoms with the pathological changes. When the infection was spreading through the lung it might be that the only signs present were loss of expansion—more obvious above the nipple or in the axilla—with some faintness of breath sounds on one side. Narrowing of Krönig's area of resonance over one or both apices might be found or diminished tidal expansion at one or other base. Dullness was not usually demonstrable at this stage, but a few fine crepitations, audible only after coughing, under the clavicle or above or external to the nipple or in the interscapular region ought to be viewed with suspicion. As the swelling of the bronchial wall increased the breath sounds became harsh, and this harshness was more easily detected in inspiration. With the broncho-pneumonia dullness appeared, often more easily detected high up in the axilla. Broncho-vesicular breathing now appeared, becoming more bronchial as the consolidation increased. It was clear from a consideration of the pathology that to detect the earliest evidence of pulmonary tubercle both percussion and auscultation must be used in conjunction with systematic inspection and palpation. In conclusion, Dr. Stewart described the technique for the radiological examination of the lungs and referred to the important points in the interpretation of the appearances seen in an early case.

In the discussion which followed, Dr. E. F. M. MACGREGOR, Dr. J. A. WILSON, and Dr. FERGUS HENDERSON took part.

New Inventions.

IMPROVED ASSALINI MIDWIFERY FORCEPS.

I HAVE modified Assalini's forceps by adding a backward curve of the handles to give an axis-traction effect in the simplest possible manner. Traction is applied to the extreme end of the handles when the full value of the backward curve is obtained. The good points possessed by the original Assalini instrument appeal to the general practitioner, who conducts



his confinements with his patient in bed. With Assalini forceps there need be no difficulty in passing the upper blade with the lower one already in place. The upper blade is passed first, horizontally in front of the sacrum and then rotated carefully into its proper position. The nurse can then hold it well back while the lower blade is passed into place. This manœuvre is not impossible with ordinary forceps, but to make it easy the lock needs to be reversed. Furthermore, the Assalini instrument entirely avoids the risk of compressing the head.

Messrs. Arnold and Sons (John Bell and Croyden, Ltd.), 50–52, Wigmore-street, London, W. 1, are the makers.

R. H. BOTHAM, M.R.C.S., L.S.A.
Skelton-in-Cleveland.

Reviews and Notices of Books.

THE STRUCTURE OF THE RED CORPUSCLE.

The Erythrocyte and the Action of Simple Hæmolysins. By ERIC PONDER, Lecturer on Physiology in the University of Edinburgh. London and Edinburgh: Oliver and Boyd. 1924. With 11 text figures. Pp. 192. 12*s.* 6*d.*

THIS book should be read by everyone interested in red blood corpuscles, which, adding together only the hæmatologists and immunologists, means a good many people. Its aim is to discuss the old problem of the structure of the red cell, why it has its extraordinary shape, and what happens when it is swollen and shrunk and lysed by various agencies, and especially what light the study of hæmolysis throws on its essential architecture. There are publishers who would have delighted to describe Dr. Ponder's dissertation on these subjects on the book wrapper as a "he-book," for the vivid zest and certainty with which he criticises and mostly condemns those who have previously ventured into the field—himself included (pp. 149, 151)—will at least arouse those attacked to think hard.

There are two outstanding problems about the structure of the red cell. The first is why it is a biconcave disc instead of spherical, as all homogeneous bodies of that size floating in a liquid ought to be and try to be; the same question arises in an even more acute form when still smaller bodies, such as influenzoid bacilli, are concerned. It seems evident that the curious shape of the red cell, so admirably adapted to its function, must be due either to an internal architecture, which is equivalent to an arrangement of ties and struts, or to local differences in the outer skin, which lead to surface forces having local effects. The second problem is—what is the structure of the cell? On this a great many different views have been put forward, ranging from the extreme on the one hand that it is essentially like a piece of gelatin (Rollett *et al.*), to the extreme on the other hand that it is a bag filled with a solution of hæmoglobin (Schafer *et al.*). Dr. Ponder rightly recognises that no certain answers can yet be given to these questions and his lively discussion will help us to clarify our thoughts. The observation that saponin makes red cells swell up into spherical balloons just before they hæmolyse strongly suggests that the shape is maintained by some sort of structure under stress, which gives way at an early stage in the process of lysis. The facts of swelling and shrinking in different salt solutions and the established differential permeability are, as Dr. Ponder points out, really impossible to reconcile with any theory of structure which does not postulate a functional, if not a morphological, limiting membrane. Contrariwise, the view that we have a simple solution of hæmoglobin in a bag is hardly compatible with the extraordinarily interesting phenomenon of reversible hæmolysis described by G. S. Adair, J. Barcroft, and A. V. Bock, and more fully by R. Brinkman and A. v. Szent-Gyorgyi (the author fails to give the reference to the latter in his bibliography: it is *Journal of Physiology*, vol. lviii., p. 204). Dr. Ponder recommends us to remain doubtful on certain unproven questions, and in the end takes his own advice and comes to a tentative conclusion that the truth lies somewhere between the two extremist positions. A large part of the book is occupied with a detailed account of the quantitative aspects of hæmolysis, mostly from the author's own researches with saponin and bile-salts. The results are simple up to a point, and it will be a satisfaction to those who believe in general principles to find him strongly in favour of the proposition that the resistances of the cells are distributed according to the normal curve. Another point to which special attention may be drawn is his proposal that the setting free of hæmoglobin is only a first stage in, e.g., saponin hæmolysis, and that it is succeeded by a phase of considerably longer duration in which the stromata are also dissolved; the process ought to be looked at as a whole, especially if its nature is going to be identified by mathematical analysis. Lysis by distilled water is not followed by this "stromatolysis."

The book, then, contains much good information and stimulating discussion and, which is more important, provides abundant incitement to thought and fresh experiment. On broad lines we thoroughly recommend it and the series of biological monographs and manuals under the general editorship of Dr. F. A. E. Crew and Dr. Ward Cutler, of which this volume is the second, will do well if the present standard is maintained. In detail, however, there is much which is unnecessarily emphatic and a certain amount which is heedlessly inaccurate. If an author assumes a polemical and critical attitude, he does well to be rather over-nice about his own precision. The method, for instance, of measuring red cells used by C. Price Jones is dismissed as "valueless" (p. 15) and the deductions as "absurd" (p. 22); "the statement made by Price Jones that fixation with osmic acid leaves the cells unaltered in size is to be emphatically denied" (p. 15), which seems going to unnecessary trouble since Price Jones makes no such statement in the papers referred to nor, we think, in any other of his writings. In a later section (p. 162) Dr. Ponder considers the theories which have been put forward to account for the nature of the process of bacteriolysis. After disposing of Arrhenius, he notes that "no evidence is adduced in favour of the highly improbable assumption" about cyclical changes in bacterial resistance advanced by H. Chick (*Journal of Hygiene*, 1908, vol. vii., p. 92) and that the modification introduced by that author in a later paper (Ibid., 1910, vol. x., p. 237) "is less reasonable than the original view, if that were possible." In neither of these papers does Chick deal with bacteriolysis; they concern the killing of bacteria by heat and disinfectants; her observations on bacteriolysis will be found in the same journal (vol. xii., p. 414). Similarly, we read (p. 164), "Henderson Smith has shown that the phenomenon of bacteriolysis is to be explained" in a way that Dr. Ponder thinks reasonable; no reference to the original is given, but the well-known papers by Smith in the *Annals of Applied Biology* (1921, vol. viii., p. 27; 1923, vol. x., p. 335) are not about bacteriolysis, but concern the killing of *Botrytis* spores by chemicals and by heat. And this is immediately followed by the assumption that the killing of *Colpidium* by corrosive sublimate is so "similar" to bacteriolysis that it is germane to a discussion of hæmolysis.

THE PSYCHOLOGY OF EMOTION: MORBID AND NORMAL.

By JOHN T. MACCURDY, M.D. Hopkins, M.A. Cantab., Lecturer in Psychopathology, Cambridge University. International Library of Psychology, Philosophy, and Scientific Method. London: Kegan Paul. 1925. Pp. 589. 25*s.*

Dr. MacCurdy when on the staff of the Psychiatric Institute of the New York State Hospitals was a colleague of the late Dr. August Hoch, whose work on "Benign Stupors" he completed for publication. The book under review continues the same theme, the psycho-analytic study of manic-depressive insanity, the conclusions as to the psychology of emotion being really a secondary product of the main research. Kraepelin's unification of the manic-depressive group is accepted, but his claim that the unity depends upon a constitutional disposition is vigorously attacked and Kraepelin is placed among "that stout-hearted little band of survivors from the period when psychology took no account of unconscious mental processes." The author enlarges the classification by introducing the reaction types of stupor, involution melancholia, anxiety and perplexity, and premises "the unknown, unconscious factor which

leads to abnormal reactions." In the discussion of theories of emotion McDougall's views, widely accepted in this country, are severely handled; MacCurdy holds that emotional expression occurs when instinctive reaction is held up, that it may be limited to objectively observed expressions, and that only when the subject has self-conscious awareness is the emotion perceived as "affect." The Œdipus complex, he claims, is recognised by its effects and provides a hypothesis to cover a large range of phenomena, the apparently incoherent utterances of the insane, for example, acquiring coherence and relevance when they are assumed to be variations of this fundamental theme. The main part of the book consists of full case descriptions of the type reactions, and the important clinical point emerges that the appearance of infantile sexuality in a gross form is diagnostic of dementia præcox with its inevitable deterioration. Chapters on dreams link up morbid and normal psychology, and the main conclusion is that "Emotional expression is the product of unconscious images which stimulate involuntary behaviour, either overt or visceral, accessory to purposeful actions."

The book is difficult reading. Some of the difficulty may be personal to the reviewer, some belongs to the subject, but some arises from a lack of emphasis that makes the selection of essentials rather a task. In Chapter XI., for example, the author writes of "this formula," but the phrase refers to a page of dissertation which the reader would be grateful to see concisely summed up in anything resembling a formula. Nevertheless, the book is a record of painstaking and original work in a direction that promises to illuminate some of the fundamental problems of psychiatry.

THERAPEUTICS.

L'Année Thérapeutique. By Dr. L. CHEINISSE. Fifth year, 1924. Paris: Masson et Cie. 1925. Pp. 186. Fr.8.

THIS therapeutic annual consists of annotations from the medical literature of the previous year, and it reviews new methods of treatment adopted not only in France, but in all the principal countries of the world under the headings of "Maladies and Symptoms" and "Therapeutic Technique and Method." Within the limits of its size it can scarcely claim to be complete, but it does give a fair idea of the trend of therapeutics, as witness the number of diseases for which insulin is recommended in the present volume. Perhaps the most pleasant feature of this little book is the author's habit of referring to a writer he is quoting as "notre confrère." This is a personal touch which will unfortunately be missing from future editions, if such appear, for Dr. Cheinisse was killed in an accident in November, 1924, and an unfinished preface to this volume represents the last lines he wrote.

OPHTHALMOLOGICAL SOCIETY'S TRANSACTIONS.

Transactions of the Ophthalmological Society of the United Kingdom. Vol. XLIV. (Session 1924.) London: J. and A. Churchill. 1924. Pp. 452.

THIS annual publication maintains regularly or improves upon its own high standard. The present volume, besides the report of the annual congress held in May, 1924, includes a report of the Oxford Ophthalmological Congress which occupied three days of July, and comparatively short reports of the proceedings of the Midland, the North of England, and the Irish Ophthalmological Societies. A discussion on the physiology and pathology of the pupil reactions will be read with interest, the opening papers being by Sir J. H. Parsons, Prof. E. Bramwell, and Mr. R. A. Greeves. Other papers worth special attention are one on the practical applications of the slit lamp, by T. Harrison Butler and Basil Graves, and an important paper on the pathology of keratitis punctata, by M. S. Mayou. There is a useful discussion on ocular symptoms in subarachnoid hæmorrhage by Leslie Paton, and one on eye symptoms in the early diagnosis of disseminated sclerosis opened by Mr. Brownlow Riddell; a paper by Dr. Ivy Mackenzie on the trigeminal system as an integrating mechanism in disorders of the eyes; and finally one by Ida C. Mann on coloboma iridis and its embryology. This last is illustrated by 16 admirably clear figures.

At Oxford the chief subjects discussed were the general principles of the treatment of concomitant squint, the openers being E. Landolt, of Paris, and Ernest Thomson, and ophthalmology from a legal aspect, a subject which was presented by Mr. H. H. Joy, K.C., in a paper containing useful advice concerning evidence in eye cases in the law courts. Other items of interest discussed at Oxford were atypical retinitis pigmentosa (H. F. Hansell, of Philadelphia), chorio-retinitis juxtapapillaris (H. Friedenwald, of Baltimore), an important paper, one conclusion of which is that since the disease is not a separate clinical entity the term should be discarded. F. Park Lewis, of Buffalo, discusses the prevention of blindness as an organised movement, and George Young contributes a paper of interest in which his method of dealing with cases of chronic glaucoma is set forth.

Of the numerous contributions to the other societies, one of practical significance is by Bernard Chavasse on the need for correctly placed trial lenses and frames in testing for refraction.

THE ROUTINE EXAMINATION OF THE EYE.

By BASIL LANG, F.R.C.S. Eng., Assistant Surgeon, Royal London Ophthalmic Hospital (Moorfields). London: E. Arnold and Co. 1925. Pp. 156. 6s.

Mr. Basil Lang has done well to rewrite and expand this little book on the methodical examination of the eye published by his father 30 years ago, in a form suitable for the requirements of to-day. The student is advised to read it with the patient or a fellow-student in front of him, so that he may be able immediately to examine the part of the eye in question. This is sound advice. It will, for example, save much time to the student as well as a certain amount of discomfort to out-patients of hospitals, if such an elementary procedure as the eversion of the upper lid be thus learnt by pairs of students practising on each other.

The book is divided into three parts dealing respectively with the external examination, the subjective examination of the eye, and examination in the dark room. It is full of good points that reflect the practical ingenuity of the author. Thus, the method of demonstrating that the contraction of the pupil when an object is seen at close quarters is associated not with accommodation but with convergence, the method of testing the amount of proptosis with the aid of the perimeter and Harman's rule, the warning against a premature insertion of cocaine in cases of corneal ulcer before the corneal sensitivity has been tested, are all important points not to be found in the ordinary text-books. So is the explanation of the familiar fact that in testing for manifest hypermetropia the patient almost invariably accepts a higher convex glass with both eyes open than when one is shaded.

In a book like this we may expect to find some individual idiosyncrasies, and this applies to the recommendation to employ a retinoscope with a hole as large as 7 mm. in diameter. On referring to Mr. William Lang's book, published in 1895, however, we find the same recommendation. Some might cavil at the assertion that in all cases except squinting children a single instillation of a drop of 2 per cent. homatropine and cocaine produces substantially complete mydriasis and cycloplegia in 40 minutes. We think that the statement needs some further qualification, but that it is to be preferred to the insistence on the use for adult patients of atropine which was formerly too often prescribed unnecessarily.

We believe that this book will be popular.

HOW IT WORKS.

Yourself and Your Body. By WILFRED T. GRENFELL, M.D. Oxf., C.M.G., Superintendent, International Grenfell Association, Labrador. London: Hodder and Stoughton, Ltd. 1925. Pp. 317. 7*s.* 6*d.*

Dr. Grenfell's two sons, he tells us in the preface to this admirable book, had reached "the age of ten million Whys? and Hows? and Whens? and Wheres?," so he took the advantage of a holiday to explain to them in simple language the way our bodies are made and how they work. This book is the result of these talks. In an interesting and amusing manner which any child can understand, Dr. Grenfell describes the principles of anatomy and physiology, everywhere illustrating his statements with pictures drawn by himself in which a bearded and unkempt fisherman (himself) and two thoroughly amused boys build up an imaginary body and conduct physiological experiments in a primitive fashion. The author appears to be rather worried lest the fundamental and necessary conception underlying the book—namely, that "an Ego controls the reactions of life through pyramidal cells, as press buttons"—be looked upon as a "menace to progressive scientific thinking." But if the book succeeds, as in our opinion it does, in inculcating in the minds of those who read it a healthy view of life as a result of sound knowledge of their bodies, surely metaphysical questions will be all the better approached when they arise in later life? At any rate, we rather envy Dr. Grenfell's sons, for if they enter their father's profession their early student days will be much easier and much more entrancing as a result of the knowledge obtained in childhood. We predict that grown-ups who buy this book for their children will dip into it with curiosity and then read it from cover to cover at the earliest opportunity. The only criticism that can be offered is that the author does not attempt the task of entering fully into the questions of sex and reproduction. He only touches on the fringe of these subjects, but the way in which he has successfully tackled the rest of physiology makes it probable that he is capable of solving the difficult problem of "how to tell our children."

Reports and Analytical Records.

ÆTHER PURISS, B.D.H.

(THE BRITISH DRUG HOUSES, LTD., CITY-ROAD, N.1.)

THIS preparation is offered as a new and distinctive quality of absolute ethyl ether. When analysed the following results were obtained:—

Specific gravity	721·0°
Boiling-point range	34·6° to 37° C.

Furfural and methyl compounds were absent, but a minute trace of peroxide was detected when the ether was submitted to the B.P. potassium iodide test. When freshly prepared this is probably a very pure form of ether.

ANTISEPTIC SURGICAL SPIRIT.

(DUNCAN, FLOCKHART AND CO., EDINBURGH AND LONDON.)

This spirit is prepared from industrial methylated spirit and has been treated with denaturants of a harmless character. It is claimed to overcome the difficulty of pyridinised methylated spirit and it may be used for all purposes where the commercial methylated spirit would have been indicated. When examined the spirit was found to be of a pale yellow colour and with a pleasant odour.

Alcohol content	87·5 per cent. by volume.
Denaturant	2·24 „ „

The denaturant was a balsam-like substance, very bitter to the palate, and causing a precipitate when the spirit was mixed with water.

BILLOWZONE.

(BILLOWZONE, LTD., 8, SHERWOOD-STREET, PICCADILLY, W.1.)

Billowzone is a saline preparation which, when dissolved in an appropriate amount of ordinary water, produces a solution said to resemble sea-water. It is claimed that when this solution is exposed in a room its exhalations have a revivifying effect on the atmosphere, resembling, in this respect, sea air.

When analysed the salt was found to have the composition:—

Sodium chloride	98·3 per cent.
Moisture	0·9 „
Matter insoluble in water	0·34 „

The solution had a faint blue tinge due to the presence of a minute amount of colouring matter and an odour certainly suggestive of the sea beach. No gas was liberated when the salt was dissolved in water. It may be pointed out that sea salt contains salts other than sodium chloride, and the proprietors claim the presence of nascent iodine. The preparation has been found useful in parasitic skin diseases and in various forms of tonsillar and pharyngeal catarrh.

SPECIAL IMPERIAL DRY CIDER (PRIORY BRAND).

(JOSEPH M. PARRY AND CO., LEOMINSTER.)

When analysed this cider gave the following results:—

Present specific gravity	1004·54°
Original gravity (before fermentation)	1044·72°
Alcohol	5·18 per cent. by volume.
Total sugar as invert sugar	1·73 per cent.
Volatile acidity (as acetic acid) ..	0·01 „ „
Fixed acidity (as malic acid) ..	0·48 „ „

The cider was examined for sulphurous, salicylic and benzoic acids and β-naphthol with negative results in each case. The cider was dry in flavour and fully fermented as the small amount of sugar present shows. It was agreeable to the palate, had a pleasant bouquet, was very bright, and in good condition.

DE KUYPER'S SCHNAPPS (SCHNAPPS AROMATICO).

(AGENTS: MESSRS. MATTHEW CLARK AND SONS, LTD., 14, TRINITY-SQUARE, LONDON, E.C. 3.)

Schnapps is the Dutch form of gin. It is a spirit distilled from grain flavoured with juniper berries and other herbs and again distilled. The sample, when analysed, gave the following results:—

Specific gravity	942·28°
Alcohol per cent. by volume ..	45·74 per cent.
Alcohol per cent. as proof spirit	80·06 per cent.
Equivalent to	19·94 per cent. under proof.
Extractives	Nil.

	Milligrammes per 100 c.cm. of absolute alcohol.
Volatile acidity	3·9
Fixed acidity	Nil.
Furfural	Trace.
Aldehydes	Trace.
Esters (as ethyl acetate)	38

No trace of sugar was found. It will be noted that this spirit is considerably above the legal limit for alcohol content of gin in this country—viz., 30 under proof. De Kuyper's Schnapps is a very pure form of potable spirit, possessing a mild and agreeable flavour.

THE LANCET.

LONDON: SATURDAY, MAY 2, 1925.

THE LEGAL RESPONSIBILITY OF THE SURGEON.

Lord RIDDELL's interesting and suggestive paper upon the above subject, read before the Medico-Legal Society,[1] serves, as he observed, to remind us that we live in times of changed aspirations and needs, or imagined needs. Some of those aspirations have been caused, and the imagination of men and women has been stimulated, by changes and progress in medicine and surgery inconceivable by those who in days long gone by moulded the common law and passed statutes for the protection of the bodies of their fellow subjects. "Maiming" to them was "such a hurt of any part of a man's body whereby he is rendered less able in fighting to defend himself or to annoy his adversary."[2] It was punishable as an act that a violent and lawless man would commit upon his neighbour, rather than as one which would be done upon a consenting party. Voluntary maiming, however, was not unknown, and a statute made it a felony for a man to maim himself in order to have "a more specious pretence for asking charity." The altered conditions now confronting us arise out of the possibilities of modern surgery and the temptations offered by changed and changing social conditions. In considering these possibilities and temptations in relation to the medical profession, Lord RIDDELL rightly, we think, declared that his main purpose was to draw attention to the situation in regard to the sterilisation of men and women arising out of modern teaching in eugenics, and out of modern views as to the limitation of families. He touched also upon the question of "cosmetic operations" performed in beauty parlours, but these we are inclined to associate with the activities of unqualified impostors, rather than with the efforts of the medical profession to preserve the physical charms of elderly women and men. The principles involved, however, include those governing the position of a surgeon asked to perform any operation not necessary for conserving or improving the bodily health of the person seeking it. Apart from the possibility of mutilation being sought with a view to soliciting charity, our forefathers seem to have usually provided only for the punishment of assaults inflicting "grievous bodily harm," for which graded penalties are now provided, the essence of an assault being the absence of consent by the injured party. What, then, is the position of a surgeon performing an operation which to him and to all but the person seeking it appears unnecessary, whether prompted by vanity, eccentricity, the desire to avoid the bringing children into the world, or any other motive not established as adequate?

Lord RIDDELL suggests, with particular relation to beauty parlours, the possibility of sepsis and death following an operation, with a prosecution for manslaughter as a sequel. This appears to us a reasonable test, subject to the observation that if an unnecessary operation were held to have had as its object the "maiming" of the deceased and to be in law a felony, the charge might be one of murder. Otherwise we may take it as a general proposition applicable to the question that "the essential feature in manslaughter is the unlawful (as opposed to felonious) doing of an act, or culpable neglect of a duty whereby the death of another is caused."[3] The word "unlawful" to lawyers does not mean necessarily the same as "illegal" or "criminal." Carnal knowledge, for example, of a woman or girl by a man not married to her is "unlawful carnal knowledge," but is contrary to law and punishable only in certain circumstances. The question therefore would seem to be whether any operation performed by a surgeon is to be deemed lawful, to which the wish of the patient, backed perhaps by the consent of his or her relatives, has been given. Lord RIDDELL would answer in the negative, having considered the matter in the light of the law, as laid down by various authorities, and we believe him to be right. He has dealt in particular with the question of deliberate sterilisation, whether of those mentally and physically sound, or of those mentally defective or diseased persons who are likely to produce undesirable citizens. He looks upon the medical welfare of the patient as the test to be observed, and believes an operation, the sole object of which is to prevent the subject of it from having children, to be clearly illegal. In the discussion which followed Lord RIDDELL's paper, prominence was given to the narrower topic of the sterilising of the mentally defective, and reference to our report will show that among those that spoke Sir WILLIAM WILLCOX and Prof. LOUISE MCILROY declared themselves against the recognition of such an operation as desirable; Sir CHARTERS SYMONDS urged that the public had a right to express an opinion on the subject, his own view being in favour of the establishment of the practice. None of them suggested that such a thing could be done in the present circumstances merely with the consent of the relatives, coupled perhaps with such consent as the patient might give. Parliament, we would add, might conceivably consider a Bill on the subject, but although everyone admits that the production of children by the mentally defective and other undesirable parents is prejudicial to the public welfare, it is, to say the least, doubtful whether public opinion, either now or in the near future, would sanction compulsory measures to render it impossible. And if public opinion would condemn the sterilisation of human beings in order to prevent the procreation of diseased offspring, it would presumably disapprove of the sterilisation of the healthy to suit their whim or their convenience.

The fact, however, that mentally defective persons cannot give a valid consent to anything on the face of it detrimental to themselves, places their case outside the general class of unnecessary operations, which a surgeon may be asked to perform upon persons able to decide for themselves and to indicate their wishes. The test there appears to be in law, whether the operation is or is not prejudicial to the public good. The individual may wish a certain thing to be done upon his body which, he thinks, will affect himself alone, but it may be contrary to public policy, if it renders him a less whole-bodied citizen. With this view the medical profession should wholeheartedly agree. It was held many years ago that "mala praxis is a great misdemeanour and offence, whether for curiosity or experiment or by neglect, because it breaks the trust which the party has placed in the physician tending directly to his destruction."[4] What Dr. GROENVELT did in this case is not recorded, but the "trust of the party" in the physician suggests the question whether a great trust is not placed in the medical man by the State when it confers on him

[1] THE LANCET, April 25th, p. 899.
[2] Hawkins: Pleas of the Crown, vol. i., p. 265.
[3] Denman's Digest of Indictable Offences, p. 386.
[4] Dr. Groenvelt's Case, 1 Ld. Raymond, 213.

certain privileges in virtue of his qualifications. It is submitted that the duties and rights assigned to him, from which others are excluded, were not devised merely as a reward for the acquirement of a prescribed amount of mental and manual dexterity, but in order to secure for the nation skilled treatment in time of physical need. It is not intended that skill so recognised by the State should be employed for gain, or even gratuitously, without there being any condition in the subject of its employment to demand it. The performance by a surgeon of an unneeded operation, appreciably injurious to the human body, at the request of an individual, should therefore be looked upon as contrary to public policy, and Lord RIDDELL appears to have demonstrated that it is also illegal and, in conceivable circumstances, punishable.

LESSONS OF A FOOD POISONING OUTBREAK.

THE outbreak of illness following the mayoral banquet at Portsmouth last November, like the similar outbreaks at Winchester and Southampton in 1902, has been traced to oysters. The epidemiological side of the outbreak was worked out with great care by Dr. A. MEARNS FRASER, the medical officer of health, and a careful analysis of the food eaten incriminated the oysters. Of the 83 persons who were promptly ill 82 had partaken of oysters, while the remaining guest who ate them was ill subsequently with an attack of diarrhœa lasting five days, but this was not until 14 or 15 days after consumption. 135 persons were present at the banquet, so that 61·5 per cent. suffered from some degree of illness within the next few days. In most cases the symptoms experienced were of the ordinary food poisoning type, such as diarrhœa, colic, vomiting, headache, feverishness and malaise. The incubation period is not set out in detail, but five were ill the same night, 35 next day, and 31 on the day following. Three of the cases are stated to have developed definite attacks of paratyphoid fever of a severe type. None of the oysters was available for bacteriological examination, but the layings from which they were said to have been obtained were ascertained and oysters from these layings were examined by Prof. J. W. H. EYRE. Those from one laying were reported contaminated, and Dr. FRASER remarks that the bacteriological results indicate, according to the standard now generally adopted, that such oysters are not fit for consumption, and would not be allowed upon the London markets. The oysters eaten were brought to the table direct, without having been relaid.

Unfortunately, the outbreak was very inadequately investigated on the bacteriological side, so that it is not possible to arrive at any conclusion as to the nature of the infection. As usual, none of the infected food eaten was available for examination, but no bacteriological examinations of materials from patients seem to have been carried out. A study of the symptoms and of the outbreak generally suggests infection with a living bacillus of the Salmonella type. An examination of excreta samples, and particularly of serum from a number of the cases, would probably have been adequate to settle the diagnosis, or at least to refute this probability. Agglutination tests, using the appropriate strains, of blood from patients have proved valuable in other outbreaks, and these could have been taken a week or more after the event. Three cases are definitely reported as paratyphoid fever, and while this appears likely from the clinical course, the bacteriological data are inconclusive. If, as appears probable, the outbreak was due to some Salmonella strain such as *B. aertrycke*, these cases would give a positive Widal agglutination reaction with *B. paratyphosus* B, and a differential diagnosis could only be made by the use of special specific type strains or by absorption tests. The exact nature of these outbreaks of illness from shellfish is still obscure, and it is somewhat unfortunate that more complete steps were not taken to utilise this outbreak to throw light upon the obscurity.

In addition to the importance of detailed bacteriological investigation of all food poisoning outbreaks, particularly of abnormal type, if they are to be prevented in the future, this outbreak also again directs attention to the need for more supervision over oyster beds. Dr. FRASER, discussing the prevention of future outbreaks, suggests that the remedy lies with the individual, and not with the health authority, and that the one safeguard of the public is to purchase oysters only from firms which guarantee their oysters to have been supplied from layings which have been inspected and approved by a competent authority. This seems rather hard on the individual and particularly inapplicable to the present outbreak, since each guest could hardly demand a health certificate with the oysters put before him. While this may be the only protection under existing conditions it is an unsatisfactory protection. Public health administrative machinery exists to protect the individual, and the proper course would seem to be only to allow oysters to be sold from layings which have been registered with and approved by an appropriate authority, or if the oysters have been relaid in approved places. This would require an alteration in the present law.

THE ANATOMICAL DISTRIBUTION OF OCCUPATIONAL CANCERS.

IT has long been known that in chimney-sweeps cancer of the scrotum is particularly frequent. The important work of Dr. ALEXANDER SCOTT [1] on the occupation dermatoses of the paraffin-workers of the Scottish shale-oil industry, which is based on clinical observations extending over 24 years and for the publication of which we are indebted to the Imperial Cancer Research Fund, has revealed a similar selectivity of the anatomical site of "paraffin cancer." Here a curious difference has been noted by Dr. SCOTT. Those men who come most into contact with the paraffin oil develop on the arms and hands diverse forms of dermatitis, which may eventually develop into carcinoma, while cancer of the scrotum is relatively rare. Thus, out of 19 cases of carcinoma, 12 were on the hands and arms and only three on the scrotum. But cancer of the scrotum occurs with relative frequency among workmen in other departments of oil-works, although these men are not engaged in occupations which entail prolonged contact with or handling of oil. It affects particularly those men who, as retort men, labourers, or stillmen, come into contact with ash, coke, dust, or other gritty material. Thus in 46 cases of cancer occurring among such men, 28 were cancer of the scrotum. Another difference is that this type of cancer is not preceded by warts or papules, but arises as a primary lesion. This problem of the anatomical site of the lesion forms the subject of a recent paper by Dr. E. L. KENNAWAY [2] entitled the Anatomical Distribution of the Occupational Cancers, in which he presents a valuable

[1] Eighth Scientific Report of the Imperial Cancer Research Fund. London: Taylor and Francis. 1923. P. 85.
[2] E. L. Kennaway: Jour. Indus. Hyg., 1925, vii., 69.

collection of statistical data covering the various occupational cancers. All these conditions present a definite site of election. Thus two-thirds of all the pitch cancers occur either in the cheek, lip, and eyelid or on the scrotum, while other parts which are quite as much exposed to pitch dust, such as hand or fingers, are but very seldom affected. In the closely related cancer due to soot—i.e., chimney-sweep's cancer—only the skin of the scrotum shows a special liability to cancer, while cancer of the face and neck is rare. Thus out of 29 fatal cases of cancer in chimney-sweeps, 27 were on the scrotum and only two on the face and neck. In mule-spinners the scrotum is, again, the site of election, although the penis and a wide area of skin on the abdomen and on the thighs is equally exposed to the action of oil. In aniline-dye workers cancer develops almost always on the bladder and on the posterior wall of it; the kidneys and ureters are only rarely affected. In persons taking arsenic it is the fingers, legs, and the trunk which are the most frequent site of cancer, while the head, neck, and scrotum were affected in only 23 per cent. of all cases.

For some of these curious phenomena a plausible explanation is suggested. Thus the restriction of the lesion to the bladder in aniline workers may be due to the carcinogenic substance being produced in the bladder from a precursor secreted by the kidneys in the urine. Again, Dr. KENNAWAY has shown that some organic substances which by themselves do not produce cancer experimentally acquire this property when passed through a red-hot tube, so that aromatic condensation products are formed, and this might explain why the workmen in oil-works who come into contact with the heated distilled products are particularly liable to be affected. But the particular liability of the skin of the scrotum to certain forms of occupational cancer remains a mystery. Neither the rugosity of the skin, which is usually given as an explanation by assuming that it facilitates the collection of dirt between its folds, nor the abundance of sebaceous glands affords an adequate explanation. In such occupations as coal-miners and agricultural labourers cancer of the penis is much more frequent than cancer of the scrotum, while in occupational cancer the ratio is reversed. It cannot even be maintained, therefore, that the skin of the scrotum is more liable to cancerous degeneration. In fact, for some countries (China, Ceylon) where cancer of the penis is relatively common, no records of cancer of the scrotum have as yet been obtained. It is desirable, therefore, that in all statistical statements cases of cancer of the scrotum and of the penis should be recorded separately and not be included under any common heading, for they seem to be quite different in origin. This is a good illustration of the great variety of factors concerned in producing the same pathological entity, epithelioma, in closely related anatomical positions.

The paper is full of valuable statistical data, and they are presented in such an interesting way as to make the dry bones of statistics live. The narrative reads almost like a detective story, but one in which the detective gets decidedly the worst of it. It is, no doubt, only the first instalment of a serial which will not come to an end before the culprit is brought to book. Perhaps the clinical observations of Sir LENTHAL CHEATLE on the relation of innervation to cancer, which have quite recently received experimental confirmation by the work of Dr. W. CRAMER,[3] may offer a clue.

[3] W. Cramer: Brit. Jour. Exp. Path., 1925, vi., 71.

Annotations.

"Ne quid nimis."

FINE POINTS AND FIRST PRINCIPLES.

A COMPELLING candour causes us to recognise that the principle that public expenditure involves public control is not always remembered by those of us who tread the thorny paths of criticism. We are forcibly reminded of the fact from time to time by the Minister of Health and his advisers in connexion with the administration of the National Health Insurance Act, and Dr. R. A. Bolam and his colleagues appearing before the Royal Commission this week and next are under no illusions on the subject. There is another principle which is to be found amongst those scheduled as fundamental in the official statement of evidence being put before the Commission on behalf of the medical profession. It avers that with the administration of any health insurance scheme medical representatives must be closely associated. We have one or two comments to make on this subject in relation to the evidence of the society, familiarly known as the NIBS.

The N.I.B.S., or National Insurance Beneficent Society, has placed before the Commission the information and statement of its views which we summarise in this issue. One of the joint secretaries, Mr. P. Rockliff, is in another capacity the secretary of the Joint Committee of Approved Societies, and is spokesman for a very considerable body of approved society opinion. We confess to some impatience with the implications in the evidence of the Beneficent Society that the actions and motives of professional men are governed by sordid considerations, from whose direful effects on the simple-minded insured person the society stands ready to offer the protection of its beneficent wing. These implications are to be observed in the references to the transfer of a fee from the pocket of the needy claimant for dental benefit to the pocket of the doctor giving the requisite certificate, and to the proposed fee of 1 guinea to an ophthalmic surgeon for an examination for spectacles on the mere 5 per cent. chance of a serious disease of the eye, and in the suggestion that the dental profession would put before the Commission a Machiavellian scheme. This scheme, apparently, in the fair garb of economy, would limit dental benefit to extractions and so produce a toothless membership of approved societies, who would then be forced to clamour for dentures, cost what they may. Such a conception of the attitude of professional opinion towards health insurance developments is not calculated to remove that distrust of lay control—and especially of approved society control—which was so deep-rooted when, in 1911, the medical profession determined that, so far as medical benefit was concerned, they would not have it, at any rate without a powerful dilution of medical representation. The very large body of society opinion in favour of devoting surplus funds to "treatment" benefits rather than "cash" benefits renders it of increasing importance to see that the principle embodied in Section 14 of the National Health Insurance Act, 1911, in regard to benefits "in the nature of medical benefits," is not lost sight of; such benefits are to be excluded from administration by approved societies. It is just that principle which the constitution of the National Insurance Beneficent Society appears to controvert.

We have referred to the protecting wing of the society. It has in fact two wings. With the technicalities by which its incorporate side and its unincorporate side are created we are not concerned. Nor are we entitled to complain that it has been found possible within the limits of one or more Acts of Parliament to construct a charitable body to which societies and their members may subscribe, and a piece of machinery which enables approved societies, through an agent, to administer treatment benefits,

unless we wholly misconceive the content of the word "administration." We can, indeed, allow ourselves to admire the ingenuity of the scheme. What concerns us most is the fact that out of the surpluses of approved societies, treatment benefits—which are "in the nature of medical benefit"—are in danger, to an increasing extent, of being administered in a way contrary to the intentions of Parliament. While the NIBS may not inappropriately be concerned with fine points, we are a little more concerned with the application of first principles.

EARLY MOVEMENT AFTER ARTHROTOMY AND ARTHROPLASTY.

WRITING in the *Presse Médicale* of April 1st, Dr. E. Desmarest discusses the lessons learnt from operating on three cases of ankylosis of the knee by the method of arthroplasty with free fascia-flaps. He lays stress on the importance of operating as early as possible after active disease has ceased, for the reason that muscular atrophy from disuse constitutes a very serious drawback to functional recovery. The very fact of the success of the operation, when strong and active muscles are able to control the joint in the complete absence of the usual ligaments, is evidence of the importance of a consideration of the state of the muscles. Dr. Desmarest follows Murphy more than Putti in his operative technique, prefers a U-shaped incision, and either divides the ligamentum patellæ or detaches it together with a thin scale of bone from its attachment to the tibia. Early massage and active movement he considers essential if a good result is to be attained. The patient should be encouraged to begin active movements in the joint almost as soon as he recovers from the anæsthetic. Dr. Desmarest gives as contra-indications to arthroplasty damage to the muscles of the thigh from osteomyelitis, old septic war injuries, with muscular atrophy and lesions of motor nerve trunks. Ankylosis from tuberculous disease is not suitable and the extremes of life should be avoided. In a communication to the *American Journal of Surgery* for March, Dr. Allen O. Whipple, of New York, strikes a like note in discussing the after-treatment of cases of arthrotomy. When this operation has been performed for loose bodies, displaced menisci, or acute non-purulent synovitis, the author strongly advocates early active movements as having a most beneficial influence on the end-result. But where large incisions have been made more caution and considerable delay are advisable. If considerable trauma has been necessary in the joint surface or structures, or if there are hypertrophic arthritic changes, immobilisation for a variable time is indicated, as it is in cases of great relaxation of the capsule.

ROEHAMPTON HOUSE.

OLD buildings do not, as a rule, make good hospitals, but Roehampton House, the extensions to which will be opened by the Queen on Wednesday next, May 6th, holds a place of its own in hospital history and economy. It had already stood, facing Richmond Park, for more than two centuries when in June, 1915, it became one of Queen Mary's Convalescent Auxiliary Hospitals. This stately and distinctly pleasing house was designed for a certain Mr. Thomas Cary, of whom next to nothing is known, by Thomas Archer, one of the aristocratic amateur architects of his day, who almost at the same moment was at work upon what is admittedly his most admirable achievement, the Church of St. Philip at Birmingham, which has now been raised to cathedral dignity. The influence of Vanbrugh is visible in both buildings, and Sir James Thornhill was brought to Roehampton to embellish a part at least of the interior. Apparently he did not get beyond the room over the entrance hall, but with that he dealt very thoroughly, painting the ceiling with the Feasts of the Gods, and covering the walls with landscapes. This work, which still endures, is not matched elsewhere for, in the main, the house is plainly panelled in painted deal. Roehampton House has had many owners and tenants, among them Dr. Markham, Archbishop of York, and latterly it was the abode of the Earls of Leven and Melville, by one of whom it was sold to Mr. A. M. Grenfell, who called in Sir Edwin Lutyens to make additions to it which nearly trebled its size, but the hospital was established there before he was able to decorate the interior of the new portions. For the immediate purpose of the hospital—the replacing by artificial means of the lost limbs of men maimed in the war—a number of wooden huts were erected, most of which have now been superseded by permanent wards of brick. There are five of these wards, each of which contains 40 beds—low, verandahed buildings connected by covered corridors. They face south and have for prospect a pleasant lawn. An operation block with two theatres and wards for electro-therapy form part of the new equipment, and in another corner of the grounds are the workshops which are busily turning out those cunningly articulated limbs which we have now learned to make with such astonishing skill and ingenuity. The inmates of the Special Surgical Hospital at Shepherd's Bush have been, or are in process of being, removed to the infinitely more restful and agreeable verge of Richmond Park, where there will be room for between 1100 and 1200 of them. Queen Mary's Convalescent Auxiliary Hospital at Roehampton will, however, no longer exist exclusively for the good of ex-soldiers and sailors. Men who are injured in limb on the railways will also be treated there, and, no doubt, eventually the victims of mining and other dangerous trades likewise. It may safely be claimed that, for its special purpose, there is no hospital in the world which excels Roehampton House, and probably nothing that equals it.

SANOCRYSIN IN TUBERCULOSIS.

RECENT reports from Denmark show that there too[1] the treatment of tuberculosis with sanocrysin is still in the experimental stage, and that such important matters as the dosage and the selection of suitable cases are still in debate. With regard to the dosage, there seems to be a general tendency towards giving smaller quantities and spacing them with longer intervals than those recommended by Prof. Möllgaard. The history of krysolgan treatment—the gold preparation which figured so largely in German medical publications a few years ago—shows the same downward graduation of the dosage in response to cases of serious poisoning, and it may be that krysolgan fell into disuse partly for this reason. In the case of sanocrysin it appears that such doses as 1 and 1·5 g. have been found often to be too toxic, both on account of the "tuberculin" action of the drug, and also because of direct metallic poisoning, the signs of which closely resemble those of sublimate poisoning. In some institutions in Denmark the initial dose of an intravenous injection has been reduced to 0·125 g. and even to 0·05 g. An interval of a week is sometimes allowed even when there is no severe reaction, and much caution is exercised in increasing the dosage. It has been argued that small doses at long intervals are dangerously timid; the vulnerability of the tubercle bacillus to the drug may, it is said, become lost. But on this point we have assuredly not yet heard the last word, and at present we do not even know with certainty what processes are at work when tuberculous tissues react to sanocrysin. It is, indeed, doubtful if the good effects hitherto achieved are due solely to the direct action of sanocrysin on the tubercle bacillus as studied in vitro. At all events there can no longer be any doubt that many of the ill-effects following an intravenous injection of sanocrysin are due to gold poisoning, pure and simple, and in a recent publication Dr. O. Scheel[2] has recorded a fatality of considerable

[1] See Preliminary Report by the Medical Research Council, THE LANCET, April 18th, p. 833.
[2] Tidsskrift f. d. Norske, Lægeforening, March 15th.

interest in this connexion. The patient was a woman who died two days after the fourth injection of sanocrysin, of which a total of 3·5 g. had been given. Shortly before death she suffered from anuria and cyanosis, but there was no fall of temperature, nor evidence of a focal reaction in the lungs. The post-mortem examination showed hyperæmia of the colon, hæmorrhages in the small intestine, and severe parenchymatous disease of the kidneys. The absence of a fall of the temperature and of clinical signs of œdema of the lungs suggests that this was not a case of sanocrysin or "tuberculin" shock, but rather one of direct gold poisoning. Other interesting observations on patients undergoing sanocrysin treatment indicate that allergy is reduced, the rate of sedimentation of the erythrocytes is hastened, and a considerable reduction of the hæmoglobin in the blood occurs. Considering how little is yet known about the dosage of sanocrysin and the indications for its exhibition, it would be premature to pass judgment on its efficacy. It is on record that patients undergoing this treatment have died, not merely in spite of it, but because of it. It is also on record that patients have responded with dramatic success; febrile, debilitated and emaciated, they have in a few weeks been restored to practically complete health. Even in the hospitals in which experience has been gained, uncertainty still exists as to the prognosis of any case submitted to this treatment.

WHOLE MILK IN INFANT FEEDING.

WHILE experts argue about percentage feeding and caloric values and this milk and that milk, the general practitioner remains rather bewildered, knowing as he does that the public is rather unimpressed by all the scientific jargon and that infants continue to thrive despite the use of foods which are denounced by the laboratory worker and the children's physician alike as dangerous and monstrous productions. Nevertheless, there is great value in a frank discussion between experts of what appears on the surface to be a relatively simple problem—namely, "Is the modification of cow's milk necessary in infant feeding?"—and this formed the subject at a meeting of the Section for the Study of Disease in Children of the Royal Society of Medicine on Friday, April 24th. Dr. Leonard Findlay made a strong case for the use of whole cow's milk, although he admitted that even he believed in the modification brought about by boiling, which he considers essential in view of the impossibility of our ever obtaining an absolutely pure milk-supply. He discussed in the first place the differences between breast-milk and cow's milk, pointing out that each of the constituents had been singled out in turn as presenting sufficient divergences to warrant modification. The problem appeared to him to be much more subtle than the mere question of the relative differences of protein, for example, in the two milks, for the real difficulty here probably lay in the essential amino-acids rather than in the particular form in which they are presented in the two milks, and any dilution of cow's milk opened up the danger that certain amino-acids might be so reduced in quantity as to give rise to disturbances in growth, just as the dilution frequently practised so reduced the iron intake of an infant as to produce anæmia. The available proof that an infant is unable to digest whole milk is to Dr. Findlay not convincing, and on the other hand, certain metabolism experiments on marasmic infants had shown that these babies had no difficulty in dealing with cow's milk. His clinical experience had gone to show that a vast majority of children digest and thrive on whole cow's milk, excluding cases where definite infective conditions of the digestive tract were present. Dr. Findlay, in short, considers that the differences between cow's milk and human milk present such a fundamental and subtle problem that the attempt to "humanise" cow's milk cannot possibly succeed, and that boiled whole milk gives better results than any modifications in all except the very youngest infants. Dr. Hugh Thursfield supported the use of boiled whole milk, stating that on purely clinical grounds it had proved to be the best substitute for breast-feeding in the healthy infant.

The case for the modification of cow's milk was presented by Dr. Eric Pritchard and Dr. R. C. Jewesbury. They brought forward the argument that breast-milk is the best food for infants and that any substitute should approximate as closely as possible in composition to breast-milk. Hence, best results were to be expected and were obtained at their hands by modifying cow's milk so as to make it as similar as possible to human milk. Dr. Pritchard pointed out that the problem is not the simple one of dealing with the protein, fat, and carbohydrate so as to obtain these three elements in correct proportion, but the much more complicated one of adjusting the relative proportions of all the 30 different elements of milk, each of which plays some part in metabolism. He pleaded for some biochemical Darwin to correlate all the vast amount of investigation carried out in this field. The problem had not been solved by the simple dilution of milk, any more than it had been solved by giving undiluted milk. The excess protein contained in cow's milk was, in his opinion, dangerous both for its immediate effects in leading to fermentation and the absorption of the toxic products of this process, and also for its remote effects, such as those produced in the liver and kidneys by the extra burden thrown on them and those taking place in that "long-suffering organ, the stomach" by the excessive acid production necessary for the digestion of cow's milk. Dr. Jewesbury also drew a gloomy picture of the results of high protein feeding, describing the clinical signs of restlessness, sleeplessness, constipation, colic, and flatulence, which he believes are all caused by too much protein, and he adduced the excellent results obtained by the simple modification of cow's milk along the lines introduced by Sir F. Truby King. Dr. H. C. Cameron uttered a warning against the taking of a rapid increase in weight as a proof of the success of one or other method of infant-feeding. He looks upon most artificial feeding as in the nature of "sighting shots," and the object of the physician should be to discover the best sighting shot. The general conclusions which arise from this discussion appear to be that for the healthy infant boiled whole cow's milk is as successful as any other food and that for the wasting baby different schools still believe that their methods are the only successful ones. The wide differences of opinion which appear to exist, however, are more likely to be modified by discussions of this nature, and perhaps the public may one day get a unanimous answer to its ever-persistent inquiry, "How are we to feed our babies if we can't breast-feed them?"

THE DIAGNOSIS OF HYDATID DISEASE.

IT is in Australia where hydatid disease is comparatively common that investigations of the serological reactions occurring in this disease can be carried out over a sufficiently large number of cases to make the results of great value. At the Australian Medical Congress of the British Medical Association held in Melbourne in November, 1923, Mr. Horace R. Dew and Miss F. Williams contributed a valuable paper on this subject, now republished in the Transactions of the Congress.[1] They report the results of three years' work on the immunity reactions occurring in hydatid disease. The three tests which have been carried out are the complement-fixation test, the precipitin test, and the intradermal test of Casoni. In the complement-fixation test the antigen used is fresh hydatid fluid and the test appears to be absolutely specific, giving a positive reaction in 80 per cent. of all cases of hydatid disease. Certain cases with thick-walled cysts, barren of scolices, and dead cysts

[1] Australian Medical Congress: Transactions of the First Session, Melbourne, 1923. Sydney: Sydney and Melbourne Publishing Co. 1924. Pp. 552.

which have undergone fibrosis or calcification fail to give a positive complement-fixation reaction, and in certain other cases some failure of the immunising mechanism is also thought to be a factor in the failure of the test. Hydatid disease in children, in which daughter cyst formation appears to be uncommon, and similarly hydatid disease of the lung, where daughter cysts are frequently absent, also give a negative result. An attempt is being made to obtain antigens of greater sensitiveness for these cases, and the merits of an alcoholic extract of scolices from hydatid cysts of the sheep and of a saline solution extract of scolices which have been digested with trypsin are being investigated. The precipitin test is carried out with fresh hydatid fluid from the sheep and unheated serum from the patient; it runs parallel with the complement-fixation test, is equally specific, and is influenced by the same factors. In its present form, however, it is not so delicate, nor is it quantitative in the same way as the complement-fixation reaction. The "intradermal test of Casoni" consists of the injection into the skin of 0·4 c.cm. of hydatid fluid obtained from the sheep and filtered through Berkefeld filters. The commonest positive reaction consists of the appearance of a wheal at the site of injection within about 20 minutes. Within 12 hours an area of erythema and swelling appears around this which spreads until a large area is involved. This is itchy but not painful, persists for 48 hours, and the wheal disappears with its appearance. There is no general reaction. There are certain variations of this; for example, the whole reaction may be over in a few hours, or there may be a long gap between the appearance of the wheal and the occurrence of the erythema. The test is absolutely specific, but needs careful interpretation and control. This test appears to be of particular value in the detection of uncomplicated cases of hydatid disease before operation. The immunological phenomena occurring in this disease are of great interest, and the combination of these three tests will, according to this recent work, enable at least 90 per cent. of cases of hydatid disease to be diagnosed.

DETERMINATION OF FALLOPIAN PATENCY.

TRANSUTERINE insufflation of oxygen or carbon dioxide gas combined with roentgenography is the ingenious method devised by Rubin, in 1919, to test the anatomical patency of the Fallopian tubes. Since that date the procedure has been extensively adopted in America with apparent success, but does not appear to have received the same support in this country, although Mr. Victor Bonney recently described in our own columns [1] a simple form of inflation apparatus and what may be learned by its use. In normal cases a measured quantity of gas is introduced into the peritoneal cavity, an artificial pneumo-peritoneum establishing definitely the patency of one or both tubes. In a recent paper,[2] based on an analysis of 1000 consecutive cases, Rubin concludes that the most advantageous time to perform the test is the fourth to seventh day after the completion of the last regular menstrual period. As is well known from the work of Hitschmann and Adler, the endometrium at this stage of the menstrual cycle has shrunk to its minimum thickness and is relatively quiet; the glands have collapsed and ceased to secrete. Theoretically, therefore, during the post-menstrual interval there should be less mechanical resistance to the passage of the gas, and Rubin has found by actual manometric readings that this is so. The risk of endometrial dislocation, air embolism, and the carrying of infection should be reduced to a minimum; neither should there be any chance of disturbing an early and unrecognised pregnancy. The method is considered to be free from danger in properly selected cases, but clinical and experimental observations have pointed to the advisability, in any event, of not exceeding a pressure of from 200 to 250 mm. of mercury. Higher pressures have been employed by experienced hands in the attempt to open tubes that have been previously demonstrated to be stenosed or closed.

[1] THE LANCET, 1924, ii., 1062.
[2] Journal of the American Medical Association, Feb. 14th.

SOCIETY FOR RELIEF OF WIDOWS AND ORPHANS OF MEDICAL MEN.

THE report for the year 1924 will be presented at the annual general meeting of the Society on May 6th. Since the last report 17 new members have been elected and 9 have died. The Society at the present time consists of 1 honorary, 156 life, and 141 ordinary members. The invested capital now stands at £148,650; in conformity with the by-laws only income may be used for the payment of grants and expenses. The income from investments amounted to £4786, £350 were received from subscriptions and donations, £68 from life subscriptions, and £600 from legacies. The working expenses were £360. During the year 5 widows died and 4 came on the funds; on Dec. 31st there were 51 widows and 7 orphans in receipt of grants. The grants to orphans on the Brickwell Fund were increased by £10 per annum, making the annual grant to each orphan from this source £25. The Christmas present to the widows was also increased, those over 75 years of age receiving £20 each and those under 75 £15 each; in previous years the Christmas present to the widows had been one of £10 each. One of the widows who had died had been on the funds since 1847; her late husband paid in subscriptions £37 16*s.* and his widow received in grants £3250; another whose husband had paid £12 12*s.* received in grants £1885. The Society, which was founded in 1788 and incorporated by Royal Charter in 1864, is open to any registered medical practitioner who at the time of his election is resident within a 20-mile radius of Charing Cross. Relief is granted to the necessitous widows and orphans of deceased members of three years' standing and of life members. The annual subscription for a member who at the time of his election is under 40 years of age, is 2 guineas, if over 40 but under 50, 3 guineas, and if over 50, 4 guineas.

TOBACCO AMBLYOPIA.

IT must often have occurred to those in charge of ophthalmic clinics to wonder why some patients fall victims to the toxic effects of nicotine so much more readily than others. It is not so very uncommon to find patients undoubtedly suffering from toxic amblyopia who tell you that they smoke no more than two ounces of shag a week, while others can stand far greater quantities up to an advanced age without any obvious ill-effects on the sight. Though the symptoms of tobacco amblyopia are characteristic—especially the paracentral scotoma—it is perhaps comparatively seldom that tobacco alone is responsible. Of other contributing factors the influence of alcohol is not likely to be overlooked. That of gastro-intestinal sepsis and of diabetes must also be borne in mind. Another possible factor is emphasised by Prof. G. E. de Schweinitz in a paper recently read before the Section of Ophthalmology at the College of Physicians of Philadelphia[1]—viz., senile changes in the optic nerve which may themselves be capable of causing a certain degree of optic atrophy, not necessarily progressive. These senile changes may depend on alteration of the small blood-vessels within the optic nerve itself; they may, on the other hand, be caused by the pressure of an arterio-sclerotic carotid artery or ophthalmic artery on the nerve: or, again, they may be due to changes in the nerve itself recently described by G. Fuchs, who found amyloid bodies developing from the neuroglia which were damaging and displacing the nerve bundles. These considerations may serve to explain the

[1] Therapeutic Gazette, Feb. 15th, 1925.

apparent difference in the capacity of different patients to resist the poison of nicotine, and also the fact that while abstinence from tobacco in most cases is followed by complete restoration of vision, in others the cure is at best but partial.

THE LATE PROFESSOR O'SULLIVAN.

SHORTLY after the death, last year, of Dr. A. C. O'Sullivan, professor of pathology in the University of Dublin, a committee was formed to collect funds in order to perpetuate the memory of his connexion with Trinity College and especially with the School of Pathology, of which he was for nearly 30 years the head. Over £1000 has been collected and with this sum a scholarship has been founded in the School of Physic. The O'Sullivan scholarship, valued at about £48 a year, is to be awarded, on the nomination of the School of Physic Committee without examination, to the most deserving candidate, consideration being given to his record in the medical school, in the University generally, and also to his financial circumstances. In addition to the foundation of the scholarship a bronze tablet has been erected in the School of Pathology which bears the following inscription :—

Alexandro Carlo O'Sullivan
Huius Collegii Socio
Qui in Hac Schola Scientiae Pathologicae Cathedram
Primus Obtinuit
Viro Magnanimo Omniumque Artium Capacissimo
Lugens Universitas
Hoc Monumentum Posuit
MCMXXIV.

The tablet was unveiled by the Provost of Trinity College on April 21st, when Dr. W. G. Smith, emeritus professor of materia medica, on behalf of the subscribers, presented the scholarship and tablet to the College.

SIR JOHN MACALISTER.

WE announced last week the resignation of Sir John MacAlister from the post of Secretary to the Royal Society of Medicine, which he has held since the foundation of that Society by the amalgamation of its constituent bodies. At the meeting of the Council of the Society last week the following resolutions were proposed from the chair by the President, Sir StClair Thomson, who said that no formal resolutions could be too generous in making public acknowledgment of the affection felt towards MacAlister, and the regret which all had experienced on realising that his state of health compelled his resignation. The following are the resolutions submitted :—

1. That the Council of the Royal Society of Medicine desires to express its profound regret that ill-health has compelled Sir John MacAlister to resign his office of Secretary, which he has held since the year 1887. In accepting his resignation the members fully realise that the Society as at present constituted owes its creation to his organising powers ; that its growth and success are chiefly due to his zealous devotion to his duties ; and that its welfare and reputation have been his life's work.

2. That the Council unanimously offers its most sincere thanks to Sir John MacAlister for his 38 years of ungrudging and loyal service to the Society.

3. That the Council sends its affectionate good wishes for Sir John MacAlister's restoration to health and vigour.

4. That the Council has great pleasure in inviting the Society to elect Sir John MacAlister as an Honorary Fellow of the Society.

Sir StClair Thomson went on to recall MacAlister's three great achievements in connexion with the Society. The first, he said, was the move of the old Medico-Chirurgical Society from Berners-street to a building in Hanover-square, large enough to house it, to lodge its increasing library, and to supply meeting rooms to many kindred societies. The second was the federation of these 18 societies into the Royal Society of Medicine, the largest society of its kind in the kingdom, and with the most complete medical library in the Empire. The third great feat was the erection of the Society's house in Wimpole-street, the move there and the consolidation of success. The words of Sir StClair Thomson and the resolutions referring to the work of MacAlister were immediately endorsed by two previous Presidents of the Society, Sir Humphry Rolleston and Sir William Hale-White, and THE LANCET desires to be associated with this tribute to MacAlister's staunch and devoted service to the medical profession. We are informed that Sir John MacAlister feels that he has no longer the vigour necessary to the adequate performance of his duties, but his resignation does not take effect till the end of June, and we hope that, when it has taken place, he will long continue to enjoy his leisure ; we are certain that his old friends will frequently see him among them. During MacAlister's absence much of the administrative work has been admirably carried on by the hon. secretary, Mr. W. Girling Ball, whose assistance was warmly acknowledged by the President.

THE BUDGET.

Mr. Churchill's first Budget is both personally and professionally interesting to the medical man. Sixpence off the income-tax will afford welcome relief to practitioners whose income is so largely earned by personal exertion, and the increase in the allowance on earned income from one-tenth to one-sixth will be of special benefit to the increasing number of medical men and women receiving fixed salaries from local authorities. Professional interest centres around the proposals for old age and widows' pensions. It has long been foreseen by medical statisticians, and pointed out more than once by Dr. J. Brownlee in our own columns, that the number of old people in 30 years' time will be vastly greater, possibly twice as great, in proportion to the working population than it is at present. No one but the medical man in an industrial area knows so well what the anxiety of failing means in old age and of the resulting economic pressure on the family circle may mean to the health of the community. Mr. Churchill's proposal will ultimately provide a pension at the age of 65 years for everyone coming at present within the scope of the National Insurance Acts, and will abolish the present restrictions and tests on pensioners at the age of 70. The cost is to be met by a weekly contribution of fourpence a man and twopence a woman in addition to the present rate of health insurance contribution, with further additions after the tenth year, ultimately increasing the man's weekly contribution to sevenpence. At the end of 80 years the Chancellor calculates this scheme will have become entirely self-supporting without any contribution from the State, which in the meantime can recoup itself out of the steadily diminishing cost of war pensions. Pensions of 10s. a week for widows of all men under National Health Insurance will come into force at the beginning of next year, with additional sums for children under the age of 14. The whole scheme is a useful instalment of social insurance which should make for national health.

THE first Lister Memorial Lecture of the Royal College of Surgeons of England will be delivered on Thursday, May 14th, at 5 P.M., by Sir William Watson Cheyne.

INCORPORATED ASSOCIATION OF HOSPITAL OFFICERS. The annual Congress is to be held at St. Thomas's Hospital, London, on Friday, May 15th, when an address of welcome will be given by Sir Arthur Stanley at 10 A.M. The Congress opens with an address by the President, Mr. W. H. Harper, at 10.15, and at 10.30 Dr. F. N. K. Menzies will read a paper on the Rôle of the Auxiliary Hospital or Home of Recovery in the Voluntary Hospital Organisation, Mr. E. W. Morris and others taking part in the discussion. At 2 P.M. Mr. A. G. E. Sanctuary will open a discussion on the Effect of Hospital Savings and Contributory Schemes on Voluntary Contributions, Dr. H. L. Eason being in the chair. At 4 P.M. there will be an official reception at the House of Commons. The annual dinner will be held at the Holborn Restaurant in the evening, and visits to London hospitals are being arranged on the following day. Inquiries may be addressed to Mr. J. E. Stone, Hon. Secretary, 28, Bedford-square, London, W.C. 1.

Modern Technique in Treatment.

A Series of Special Articles, contributed by invitation, on the Treatment of Medical and Surgical Conditions.

CXX.—THE TREATMENT OF EXCESSIVE LOSS AT THE PERIODS.

I. WHEN THE UTERUS IS ENLARGED BUT NO FIBROIDS ARE PRESENT.*

General Considerations.

MENORRHAGIA means excessive loss at the menstrual periods, but its occurrence is often not *monthly* because the happenings in the ovary which determine the menstrual flow may occur at shorter or longer intervals than that. As a rule these happenings take place regularly, so that the menstrual flow is regular though perhaps not monthly, but sometimes the ovary itself is "irregular," so that the menstrual flow is irregular too. The term metrorrhagia signifies loss occurring between the menstrual periods and unconnected with those ovarian changes which are the basis of menstruation, and it is therefore necessary to distinguish this form of irregular bleeding from a menorrhagia which, though irregular, depends for its initiation on changes in the ovary. Metrorrhagia is quite independent of such changes, and indeed can, and sometimes does, occur in a woman who has no ovaries. This article deals with menorrhagia only.

Normal menstrual loss passes into menorrhagia so soon as the woman begins to lose more blood than she can afford. In this regard there are great individual differences. Some persons throughout their lives lose each month an amount of blood considerably in excess of the normal and yet without ill-effect, their blood-forming apparatus presumably being equal to the demand. In determining whether a woman has menorrhagia this fact must be taken into account and inquiry made as to the amount she has been accustomed to lose since her menstrual life began. The amount lost is also relative to the patient's physique. A big woman can, other things being equal, afford to lose more than a small woman. It is usual to gauge the blood loss by the number of diapers used during the whole period; thus eight signifies scantiness, 12 somewhere about normal, 16 distinctly too much, 20 undoubtedly excessive, and 30 or 40 "flooding." The rapidity with which the blood is lost must also be taken into account. A woman who uses 12 diapers during a period lasting three days loses much faster than one who uses the same number during a period lasting a week. In some cases, again, a large proportion of the total number are used within the first 24 or 48 hours, so that the loss whilst at its maximum rate is excessive, though the total amount lost is not so. A woman who uses eight diapers in one day is losing too much, even though she only uses 12 over her whole period of five days. The loss may be excessive by too long continuance as well as by too rapid flow, and in the severe cases both abnormalities are coexistent.

The diagnosis of menorrhagia in any given case rests finally on a general survey of the patient herself. If she is losing too much she will be anæmic, at first only immediately during and after the period, but later on continuously. A woman anæmic from whatever cause is obviously unfit to lose any blood at all until her blood content is restored; to her even a normal period is "menorrhagia." Considerations of this sort frequently arise, notably in cases where it has to be decided whether to stop the periods altogether by hysterectomy or adopt some other course, operative or medicinal, with the view of making the loss "normal" again. Where a patient is very exsanguine, as, for instance, in some cases of fibroids, the periods of themselves often diminish in profuseness, and unless the medical attendant takes these facts into consideration he may mistakenly suppose his patient to be improving; whereas relative to her extreme anæmia the monthly loss is just as harmfully excessive as ever it was. Any improvement of the blood content of these patients by medicinal means at once causes the loss to increase again.

When it is determined that the patient is really losing too much, the next step is to seek the cause by physical examination. As far as the uterus is concerned, broadly speaking, one of three conditions will be found: either it will be (1) abnormally large, (2) normal in size, or (3) abnormally small.

Menorrhagia with an Enlarged Uterus.

A large uterus, other things being equal, will bleed more than a small one because the menstrual area is bigger. Sheer enlargement then without any structural disease will cause the loss to be excessive. The size of the uterus varies a little in normal virgin women, but not to any great extent, though I have seen a few cases where the oversize was so marked as to suggest a developmental abnormality, the reverse of the undersized uterus much more commonly met with.

Subinvolution.—The commonest cause of simple enlargement unaccompanied by gross structural disease is subinvolution, and in its lesser degree it is present in many parous women whose wombs remain permanently bigger and whose periods remain slightly but definitely freer than they were before the women conceived. When the failure to return to the normal size is marked, menorrhagia usually accompanies it. The subinvoluted uterus for at least six months after the pregnancy is capable, I think, of being reduced in size by suitable treatment, but after this period the enlargement becomes increasingly established, until eventually certain intimate structural changes take place in its substance which result in one form of the condition known as "fibrosis." The term, however, is ill applied to this class of case, for the primary change is in the nature of a hyaline degeneration of the muscle-fibres to which the apparent overgrowth of white fibres at a much later stage is secondary. A uterus in this condition usually bleeds profusely, and also often presents other abnormalities —e.g., retroversion, cervical laceration, chronic cervicitis, and erosion.

In the treatment of these cases the first point to bear in mind is that for, say, six months after labour there is certainly a fair chance that suitable treatment may cause involution to take place, but after this period the likelihood of the big uterus shrinking becomes less and less. Ergot is the first drug to try and should be given in full doses (3i.) t.d.s. from a few days before the period is due until the flow is over. If the loss is very great pituitrin can be given hypodermically once or twice a day. If these fail other uterine styptics are not likely to succeed, but they can be tried. Many of these cases present retroversion as well, and it is important to rectify this, not only because reposition at this period may permanently cure the displacement, but because retroversion delays or prevents involution. Drugs failing, the uterus should be curetted. The results obtained from this operation are best when its application is not too long delayed. If retroversion is present this should be corrected at the same time by manual or instrumental reposition and the temporary introduction of a pessary. Such treatment, if carried out within the first six months, often cures the patient. The pessary, however, should not be worn for more than six months; if at the expiry of this period the uterus retroverts when it is left out the instrument should be abandoned and the patient advised to have the displacement permanently corrected by operative means.

When subinvolution has existed for a long time the chances of curettage benefiting the menorrhagia

*An article on the Treatment of Excessive Loss at the Periods, when the uterus has fibroids, is normal in size or small, will appear next week.

are much diminished, because the uterine wall has undergone permanent change. In such a case when, after the usual drugs have been tried and failed, curettage is in contemplation the surgeon will be well advised if he tells the patient beforehand that the operation may fail in its intent, adding, however, that it is advisable because there is nothing between it and more drastic measures. If retroversion is present this should be dealt with at the same time by intraperitoneal shortening of the round ligaments and coexistent cervicitis should be met by excision of the inflamed surface and repair, the aim of the surgeon being to leave the parts in as normal a condition as possible in the hope that the degenerative processes in the uterine wall may stop or regress.

There are times when the hæmorrhage is so severe that it becomes urgent to relieve it with certainty. In women over 40 years of age hysterectomy is the simplest solution of the problem, but the difficult cases are those in which the patient is relatively young, and removal of the uterus is to be avoided if possible. In such, as an alternative, I have employed abdominal hysterotomy. The abdomen being opened the uterus is incised through its anterior wall until its cavity is opened and the endometrium is then scraped far more thoroughly than can ever be done from below. The handle of the scalpel is a most efficient scraper. Such thorough curetting is often followed by several months amenorrhœa, and in my hands it has proved a successful operation. There is this advantage in opening the cavity of the uterus—namely, that more frequently than would be thought some intra-uterine condition, like a small fibroid or mucous polyp, is discovered, which is the real cause of the bleeding, although its presence was not detectable by other means. When the uterus is considerably enlarged it may be reduced in size by cutting part of it away (utriculoplasty).[1] When doing this operation I used to excise a wedge-shaped portion, cutting through both front and back walls, but I now excise the front wall only so as to keep the suture line on the anterior surface.

There is a further class of case in which it is undesirable to remove the uterus because of the likelihood of making worse an already existent prolapse of the vaginal vault. In such cases I excise the entire corporeal endometrium and suture the rest of the corpus so as to make it into a solid column of muscle tissue. This column is then ventrofixed so as to act as a ligament to keep up the weak vault. This is a good operation.

There are two other ways of dealing with hæmorrhage from a *chronically subinvoluted uterus*—radium and X rays. Radium acts by destroying less or more of the endometrium, and is, in fact, equivalent to curettage, except that it produces more fibrosis. If the destruction is limited to the superficial layers the periods may be lessened in amount, or even temporarily suppressed for several months, as after hysterotomy and curettage. If the destruction is complete permanent amenorrhœa is effected. Totally to destroy the endometrium a considerable exposure is required, but on account of its varying thickness it is impossible accurately to gauge the exposure required to do this, and, moreover, there is a degree of danger in procuring an effect so drastic. Where the uterus is definitely enlarged I hold that radium is not the treatment of choice, and still less so if, in addition, displacement or chronic cervicitis and erosion are coexistent. With a normal sized uterus, or one smaller than normal, the indications for its use are stronger.

X ray treatment in these cases is as much to be condemned as it is in cases of fibroids, under which heading I will refer to it more particularly.

VICTOR BONNEY, M.S., M.D., B.Sc. Lond., F.R.C.S. Eng.,

Surgeon to the Chelsea Hospital for Women; Assistant Gynæcological Surgeon to Middlesex Hospital, &c.

[1] Arch. Middlesex Hospital, 1910, vol. xviii.

Special Articles.

NOTES ON SOME PHYSIOLOGICAL PROBLEMS OF MOUNT EVEREST.

BY LEONARD HILL, M.B. LOND., F.R.S.,

AND

ARGYLL CAMPBELL, M.D., D.Sc. EDIN.

(*From the National Institute for Medical Research, Hampstead, N.W.*)

I. GLACIER LASSITUDE.

IN dealing with the physiological difficulties of the Mount Everest Expedition, 1924, Major Hingston,[1] the medical officer, drew attention to what he termed glacier lassitude. To quote his own words:—

"A distinct feature in the Mount Everest region is the very pronounced glacier lassitude which develops over tracts of ice. This was most marked on the Rongbuk glacier, especially when passing through a trough in the ice at an altitude of 20,000 feet. The trough was a remarkable feature, being girt on either side with walls of ice in many places hewn into fantastic pinnacles and ornamented with pyramidal spires. In this trough there was a peculiar sapping of energy, a weakness of the legs, and a disinclination to move. It was not a breathlessness due to exertion, but to a loss of muscular power. There was a feeling of prostration. One seemed to drag oneself along, instead of going with the usual strength. A profuse sweating was not uncommon. It was something like the oppression experienced when marching through a hot moist jungle in the rains. The lassitude appeared immediately after stepping on to the glacier; it was as quickly relieved on again reaching rock or moraine. It was most noticeable in the absence of wind and in the middle of the day when the sun was strong. It was absent late at evening and in the early morning, and was less marked on cloudy days.

"The cause of this lassitude is easily explained. The conditions for its development are a sheet of ice, a hot sun, and a still air. The sun melts the superficial layer of the ice. The lowest stratum of the atmosphere becomes saturated with moisture but does not rise owing to its being chilled by contact with the ice. Thus, when on the glacier, one is in a saturated atmosphere, and this, in conjunction with the high altitude, is sufficient to cause the unpleasant effects.

"We did not notice that other atmospheric conditions had any special influence on these high altitude symptoms. This was different from my experiences in the Western Himalaya. There, on two occasions, our party climbed the same peak to a height of 18,203 feet. During the first ascent the sky was clear, the air was free from moisture, and our disability was slight. On the second occasion the conditions were different. The sky was dark, stormy weather was imminent, and the atmosphere felt heavy and damp. Our distress on this second occasion was acute. Every few paces found us gasping for breath, and we had repeatedly to make short halts. The same explanation applies to this as in the case of the glacier lassitude. On the second ascent the atmosphere was laden with moisture. The free evaporation of perspiration was checked and, as a consequence, the high altitude symptoms were increased."

Major Hingston thus clearly demonstrates that great lassitude was produced by overheating the body whilst at a high altitude, whereas the altitude alone caused no such symptoms. He does not give any physiological explanation of this prostration. We know already that ordinary discomfort due to overheating is accompanied by an increase in pulse-rate; in fact, it is generally agreed that the pulse-rate is the best indicator of discomfort due to overheating. Major Hingston does not give the pulse-rate of his subjects whilst suffering from glacier lassitude. Altitude itself, as is well known,[6] increases the pulse-rate at rest, and markedly increases the pulse-rate whilst at muscular work. Here again pulse-rate is considered to be a good indicator of distress.

We consider that most likely the combined effects of overheating and altitude caused the prostration

by fatigue of the heart, the heart having to pump blood to the skin for cooling as well as to the muscles for work. Since we do not know of any previous experiments dealing with such a combination we record below some experiments which demonstrate that the combined effects of these two conditions markedly increase the heart beat. Previous observers have obtained some evidence that heart output is increased by overheating and by anoxæmia. Uyeno [2] has shown that the pulse-rate and output from the heart are increased by overheating. Haldane,[3] in reviewing the effects of anoxæmia upon the circulation, states that there is an increase of pulse-rate and of heart output. There is, however, some evidence[4] that heart output is not increased at rest by anoxæmia, although the pulse-rate is definitely increased.

TABLE I.—*Subject C. P. (Age 30 Years; W. = 58 kg.; H. = 161 cm.) Working on Ergometer, 300 kg. per min.*

No. of expt. and date in 1924	I. 19/11.	II. 2/12.	III. 3/12.	IV. 4/12.	V. 5/12.	VI. 9/12.	VII. 10/12.	VIII. 11/12.
O_2 per cent. breathed	12·4	13·0	10·9	13·6	10·3	20·9	20·9	12·7
Temp. of room °C.—								
Dry bulb	20·0	9·0	20·0	20·0	10·0	8·0	20·0	20·0
Wet bulb	15·0	9·0	15·5	14·5	8·0	7·0	14·5	14·5
Dry kata. of room	5·0	31·0	5·0	5·0	32·0	32·0	5·0	5·0
Temp. of air in balloon °C.—								
Dry bulb	20·0	12·0	20·0	21·0	10·0	—	—	20·0
Wet bulb	12·0	10·0	16·0	12·0	8·0	—	—	20·0
Pulse-rate—								
Before 1st period of work	80	72	78	78	78	78	78	78
After 3 mins. work	132	120	132	122	128	100	108	129
„ 5 „ „	135	120	139	120	134	104	115	140
„ 7 „ „	140	132	142	129	148	105	115	140
„ 10 „ „	144	132	—	130	—	107	120	—
Before 2nd period of work	—	84	—	83	—	82	82	—
After 3 mins. work	—	108	—	122	—	95	114	—
„ 6 „ „	—	108	—	130	—	98	119	—
„ 8 „ „	—	110	—	134	—	98	122	—
„ 10 „ „	—	114	—	134	—	98†	127	—
Blood pressure—								
Before work 1st period	—	—	—	S120 D80(40)*	S95 D60(35)	S120 D75(45)	S95 D70(25)	S105 D70(35)
After „ „ „	—	—	—	S120 D50(70)	S110 D55(55)	S110 D60(50)	S105 D55(50)	S110 D60(50)
Before „ 2nd „	—	—	—	—	—	S100 D75(25)	S95 D60(35)	—
After „ „ „	—	—	—	S90 D30(60)	—	S110 D60(50)	S95 D50(45)	—

Symptoms.—19/11: Weak; giddy; lips dark blue. 2/12: Headache. 3/12: Weak; giddy; lips dark blue. 4/12: Weak; giddy. 5/12: Weak; giddy; shivering. 9/12 and 10/12: Nil. 11/12: Weak; giddy; lips dark blue.

* Figures in parentheses give the pulse pressure. S, systolic; D, diastolic.

† The pulse-rates were lower in the second period of work (98) than in the first period (107) because the subject was cooler during the second period, having been exposed longer to the cold wind. The same effect is shown in Exp. II.

Plan of Experiment.

We employed two subjects, C. P. and D. S., who had acted as subjects in similar experiments on several previous occasions. They were not acclimatised to breathing oxygen at low tensions. C. P. was a healthy active individual but not of athletic habit. D. S. was of athletic habit and kept himself in training for football. D. S. wore ordinary winter clothing—that is, he was warmly clad—whilst C. P. wore light summer garments and worked in his shirt-sleeves and collarless. They worked on Schuster's[5] modification of the bicycle ergometer, doing only light work—namely, 300 kilogrammetres per minute at about 70 revolutions per minute, the pace being controlled by metronome. D. S. worked only for ten minutes, whilst C. P. worked for two periods of ten minutes separated by an interval of rest of about 12 minutes' duration; this was sufficient to give evidence—e.g., weakness (faintness), giddiness, headache—of oxygen deficiency under our conditions. All the experiments were carried out about three hours after breakfast.

To imitate the atmosphere at an altitude of 20,000 feet we used mixtures of gas containing about 10–13 per cent. of oxygen—that is, about half the oxygen content of the normal atmosphere at sea level, namely, 20·9 per cent. The gas was placed in a large balloon capable of holding 3000 litres, and the subject breathed the gas through an ordinary mouthpiece fitted with Rosling valves. The mouthpiece was used also when breathing normal air, to keep the experimental conditions constant. Some experiments were carried out in a laboratory room which was heated up to about 20° C.—that is, not very warm. Others were carried out in a tunnel at about 8–10° C., but as the tunnel was fitted with a large fan fairly cold conditions were obtained, giving high cooling powers as measured by the kata-thermometer.

Systolic and diastolic blood pressures were estimated by the auscultation method (brachial artery) just before commencing work and immediately after cessation of work. At intervals during work the pulse-rate was counted in the radial artery at the wrist, counts by two different observers agreeing closely; none of the figures exceeded 150 per minute.

The main results of the experiments are given in tables; full details for subject C. P. will be found in Table I. As the details for D. S. were similar they are omitted. Some experiments were carried out in which the subjects walked for ten minutes on a revolving platform at the rate of four to five miles an hour. The results obtained were similar to those given for the ergometer and are therefore omitted.

Increase of Pulse-Rate under Warm Conditions.

The main results of these experiments are given in Table II. We compared two sets of atmospheric conditions keeping other experimental conditions similar; one set of experiments was carried out in a moderately warm room about 20° C. dry bulb, and with a dry kata-thermometer cooling power of about 5 millicalories per sq. cm. per sec.; the other set of experiments was carried out in a tunnel with a strong wind blowing, the dry-bulb temperature being about 8–10° C., whilst the dry kata-thermometer cooling power was about 32.

In Table II. the experiments are numbered mainly for reference to the detailed accounts in Table I. In Tables II., III., and IV. the experiments which are compared with one another are bracketed together. It will be observed that with subject D. S. (Table II.) the pulse-rate was on an average 12 beats per minute faster under the warmer conditions (dry kata cooling power 5·0) than under the cool conditions (cooling power 32·0). C. P.'s pulse-rate was very much faster

under the warmer conditions (cooling power 5·0), being on an average 24 beats per minute faster than under the cooler conditions (cooling power 32·0). C. P., as already stated, was only lightly clothed and remained longer in the cold wind than D. S., and was therefore much more cooled down by the wind than D. S. It will be observed that these differences were similar, whether the subject was breathing oxygen at a high percentage, i.e., 20·9, or at low percentage, i.e., 10–13. Under the low oxygen tensions due allowance was made for the effect of temperature upon the oxygen content of a given volume of gas; of course, the quantity of oxygen present in a given volume of gas at 0° C. is nearly 0·8 per cent. higher than in the same volume of gas at 20° C., owing to expansion under increase of temperature.

TABLE II.

Subject.	Expt. No.	Dry kata-thermometer cooling power.	O_2 p.c.	Pulse-rate during last minute of work.	*Increase in pulse-rate due to— A.
D. S.	IV.	5·0	20·9	125	11
	III.	32·0	20·9	114	
	I.	5·0	10·9	140	10
	II.	32·0	10·3	130	
	V.	5·0	11·3	135	15
	VI.	32·0	10·7	120	(Av. = 12)
C. P.	VII.	5·0	20·9	127	29
	VI.	32·0	20·9	98	
	IV.	5·0	13·6	134	20
	II.	31·0	13·0	114	(Av. = 24)

TABLE III.

					B.
D. S.	I.	5·0	10·9	140	15
	IV.	5·0	20·9	125	
	II.	32·0	10·3	130	16
	III.	32·0	20·9	114	
	V.	5·0	11·3	135	10
	IV.	5·0	20·9	125	(Av. = 14)
C. P.	IV.	5·0	13·6	134	7
	VII.	5·0	20·9	127	
	II.	31·0	13·0	114	16
	VI.	32·0	20·9	98	(Av. = 11)

TABLE IV.

					C.
D. S.	I.	5·0	10·9	140	26
	III.	32·0	20·9	114	
	V.	5·0	11·3	135	21
	III.	32·0	20·9	114	(Av. = 23)
C. P.	IV.	5·0	13·6	134	36
	VI.	32·0	20·9	98	

* Increase in pulse-rate due to *A*, warmer conditions; *B*, low oxygen; and *C*, low oxygen plus warmer conditions.

Increase of Pulse-Rate due to Breathing Air with Low Oxygen Tension.

These experiments are given in Table III. Here the atmospheric conditions were kept constant whilst the oxygen percentage was varied from about 10 to 21. It will be observed that with subject D. S. the pulse-rate was on an average 14 beats faster whilst at work and breathing oxygen at low tension. Some experiments were done under warm conditions, i.e., cooling power 5·0, and some under cool conditions, i.e., cooling power 32·0, the effect of the low oxygen tension being much the same in both cases. C. P. gave similar results, his pulse-rate on an average being 11 beats faster per minute whilst breathing oxygen at low tension; his experiment under the warmer conditions, i.e., cooling power 5·0, did not show so great a difference in pulse-rate as those of D. S. under similar conditions because C. P. was more lightly clothed and therefore less heated.

Increase in Pulse-Rate due to the Combined Effects of Warm Conditions and Low Oxygen Tension.

We have shown that in D. S. the pulse-rate was about 12 beats faster under warm conditions, and about 14 beats faster under low oxygen tension, so that, as might be expected, the effect of combining these conditions was that the pulse-rate was about 26 beats faster than whilst breathing normal air under cool conditions. Similarly, for subject C. P. the combined effects of heat and low oxygen tension produced a pulse-rate about 35 (24 + 11) beats faster than the rate under cool conditions with normal oxygen tension. This comparison is made clearer in Table IV. The details of the experiment under the warmer conditions (cooling power 5·0) and with low oxygen tension (10·9–13·6) are in each case given above those for the cooler conditions (cooling power 32·0) and with normal oxygen tension (20·9). C. P. was more affected by breathing air with low oxygen tension than D. S. C. P. was not able to work for any length of time with a lower oxygen tension than 13 per cent. without becoming weak and giddy. C. P. was less in training than D. S. Athletes in training are less affected by altitude than more sedentary individuals.

In both subjects symptoms of anoxæmia and discomfort were more marked under warm conditions with low oxygen tension than under other conditions studied.

Effect of Breathing Air Saturated with Moisture and at Low Oxygen Tension.

Major Hingston refers to the air being saturated with moisture in the case of glacier lassitude. It was considered that breathing air saturated with moisture might, at low oxygen tension, interfere with the passage of oxygen through the lung epithelium into the blood, owing to (*a*) the lowering of oxygen partial pressure by increase of vapour pressure—this factor is almost negligible in itself under the conditions concerned; (*b*) increased wetness of the pulmonary epithelium—e.g., as in œdema. Using the pulse-rate as an indicator, experiments were carried out breathing fairly dry air (relative humidity 50–60 per cent.) and breathing air saturated with moisture (relative humidity 100 per cent.), the oxygen tension being low in both cases. The pulse-rates were much the same, so we concluded that the moisture did not interfere with the absorption of oxygen under our experimental conditions.

The experiments concerned are for D. S., Nos. V. and I., and for C. P., Nos. VIII. and I. In the first-mentioned experiment for each subject the air in the balloon was saturated with moisture (T. = 20° C.). In the second experiment the air was much dryer (dry bulb = 20° C.; wet bulb = 12° C.).

Blood Pressure.

Schneider and his colleagues[6] have studied the problem in detail and have shown that light muscular work at high altitude causes but a slight increase in systolic blood pressure, but more severe work markedly raises the blood pressure. An examination of our figures for blood pressure given in Table I. will show that breathing air with low oxygen tension during light work did not produce any immediate after-effects on blood pressure which differed materially from those obtained when air with normal oxygen tension was breathed, although the former conditions produced cyanosis and giddiness. It was observed that the pulse pressure—i.e., the difference between systolic and diastolic pressures—was greater after work than before; this was not dependent upon the oxygen tension in the air breathed and was previously observed under normal conditions by Dawson.[7]

Conclusion.

From the above results it may be concluded that "glacier lassitude" was due to the combined effects—of over-heating of the body and of breathing oxygen at low tension—upon the heart; and also that under such conditions the pulse-rate is a good indicator of distress of the heart and of body discomfort, a pulse-rate of 140 per minute being observed in our subjects just before failure to complete the task imposed upon them.

II. THE VALUE OF OXYGEN.

Major Hingston[1] points out that theoretically the breathing of oxygen should have proved of enormous benefit in alleviating the symptoms produced by the high altitude. He states that it is remarkable how little benefit was obtained from the oxygen compared with the experiences of the previous expedition. In the discussion which followed Major Hingston's paper Prof. Haldane stated that in acclimatised individuals it is not mainly want of oxygen which is worrying immediately at onset of muscular work at high altitude, but excess of carbon dioxide which must be kept much lower in order to preserve normal alkalinity, the blood losing alkali at high altitude. Mr. Barcroft pointed out that the climbers may not have been getting the adequate or calculated amount of oxygen, and questioned whether the cumulative effects of want of oxygen over days and weeks can be abolished by the immediate breathing of oxygen. This appears to be of great importance; it is not likely that results obtained by breathing oxygen during anoxæmia at sea-level may be applied to an individual who has become acclimatised to such high altitudes.

Some results indicating the beneficial effects of breathing oxygen at high tension during exercise at sea-level are of interest in the present discussion. L. Hill and Flack[8] showed that an athlete can perform vigorous exercise for a longer period when breathing oxygen at a high tension; they showed that the high oxygen content in the lung enabled an athlete to tolerate a higher CO_2 tension—even up to 11 per cent.—in the alveolar air. They[9] also found that the time taken to run a given distance is lowered, the pulse frequency lowered, and blood pressure kept up by breathing oxygen and a feeling of relief to the dyspnœa is given by the oxygen; they thought that oxygen inhalation increased the lasting power and lessened the fatigue of athletes by maintaining or restoring the vigour of the heart. More recently A. V. Hill and his colleagues[10] have suggested that the heart output during work varies directly as the oxygen saturation of the arterial blood, because they found an increase of oxygen-intake whilst breathing oxygen at 50 per cent., instead of the normal 21 per cent. oxygen, and a decrease of oxygen-intake whilst breathing oxygen at 11·3 per cent. In other words, anoxæmia decreased the output of the heart during work, and increased oxygen saturation of the blood increased the output of the heart. It is difficult to understand how there can be any "unsaturation" of the arterial blood whilst breathing oxygen at 21 per cent. unless the subject is unfit to do the task or the breath is held during it. We know that many believe there is during exercise in untrained individuals some anoxæmia, but we doubt if any observer has proved by direct observation that the arterial blood is at all unsaturated by muscular exercise in fit individuals breathing freely. One of us (J. A. C.) has carried out observations on rabbits which in order to escape being held struggled vigorously for a few minutes until tired. Exercise produced a slight increase in the saturation of the arterial blood whilst the animal was breathing ordinary air with 21 per cent. oxygen. Samples were taken immediately before and immediately after exercise from a large artery of an ear of a suitable rabbit and the oxygen content in 2 c.cm. of blood estimated by Van Slyke's method. The five experiments completed indicated about 15 volumes per cent. in the arterial blood, a normal figure for the rabbit. If, then, exercise does not produce any unsaturation of the blood whilst breathing 21 per cent. oxygen, it is difficult to see how breathing 50 per cent. can make any difference beyond the increase in the quantity of oxygen in solution; this, although small, may quite easily be doubled in amount. Thus, if the alveolar oxygen is at a tension of 90–100 mm. Hg there would be about 0·25 volume per cent. oxygen in solution and the hæmoglobin fully saturated, whereas if the alveolar oxygen tension were increased to 150 mm. Hg the hæmoglobin is, of course, fully saturated, but the dissolved oxygen is now 0·40 volume per cent.—a big increase on 0·25. It is quite possible, then, that it is the oxygen in solution in the blood which is the deciding factor. It is obvious that as far as the cells of the respiratory and other centres, and of the heart and other organs, are concerned, it is the oxygen in solution that first alters their surrounding conditions. We know that the excised heart can be kept beating if the coronary arteries are perfused with oxygenated Ringer's solution, and that a mouse poisoned with carbon monoxide can live in two atmospheres of oxygen, there then being enough in solution to keep it going (Haldane).

Therefore the amount of oxygen in solution in the blood and tissue fluids is probably of more importance at a high altitude than the degree of saturation of the hæmoglobin with oxygen; of course, one depends to a great extent upon the other; but the limiting factor to endurance may be the removal of O_2 from the fluids bothering the tissue cells at a rate more rapid than the passage of O_2 from the blood to these tissue fluids; the latter, of course, depends upon the O_2-tension in the plasma—i.e., the oxygen in solution. It may be that in the Everest climbers the oxygen in solution is below the limit required by the nervous system and heart. Thus if, say, at 29,000 feet, where the pressure is about one-third atmosphere or 250 mm., to gain any advantage at all from oxygen nearly pure oxygen would have to be used. The Everest oxygen apparatus was arranged to deliver up to 5 litres per min., the oxygen flowing through a tube held in the mouth. Supposing the tap was turned so as to give 3 litres, these at one-third atmosphere pressure would expand to 9 litres, and much would be lost to the air. The mouth would be open owing to the deep respirations taken, and the dilution of oxygen with air was then probably great. Breathing air containing, say, 30 per cent. of oxygen at this height would only give about 84 mm. pressure in the air breathed and perhaps only about 60 mm. pressure of oxygen in the alveolar air, which would mean less than 90 per cent. saturation and only 0·18 volume per cent. oxygen in solution. This is shown in Table V., slightly modified—after Van Slyke and Stadie.[11]

TABLE V.—*Oxygen Estimated Held in Physical Solution by Blood at 38° C. at Different Oxygen Tensions and Saturations.*

A. = Saturation of hæmoglobin in blood with O_2 (per cent.).
B. = O_2 tension (alveolar air) corresponding to saturation in column A. (mm. Hg).
C. = Oxygen physically dissolved at 38° C. (vol. per cent.).

A.	B.	C.	A.	B.	C.	A.	B.	C.
0	0	0·00	50	27	0·08	95	90	0·24
10	11	0·03	60	31	0·09	100	120	0·32
20	16	0·04	70	37	0·11	100	140	0·37
30	19	0·05	80	46	0·13	100	150	0·40
40	22	0·07	*90*	*65*	*0·18*			

Since the alveolar oxygen tension is normally about 90 to 100 mm. Hg there is normally in solution in the blood 0·3 volume per cent. oxygen, and this is the amount immediately available for the tissues, e.g., nervous centres and heart muscle, as the blood flows through them. Perhaps too little attention has been directed formerly to the oxygen in solution in the blood, and it may be the increase in the amount of this whilst breathing oxygen at high tension which is responsible for the increased output of heart, increased intake of oxygen, and general relief to subjects performing excessive muscular work. Also at high altitudes it may be the decrease of the oxygen in solution which is the important factor.

Summary.

(1) In such conditions as "glacier lassitude" as experienced on Mount Everest, produced by the combined effects of overheating the body and of breathing oxygen at low tension during light muscular

work, the heart beat is markedly increased in rate owing merely to summation of the effects of each factor upon the heart. The pulse-rate is an excellent guide to discomfort and distress of the heart during such conditions, a rate of 140 per minute being considered the limit of safety in the subjects under the conditions specified.

(2) The presence of moisture in the air does not interfere with the passage of oxygen through the lung epithelium, although it greatly influences the heart through the overheating of the body owing to reduced evaporation of fluid from the body.

(3) The beneficial effects of breathing oxygen at high tension during exercise are considered to be due to the increased amount of oxygen in physical solution in the blood.

(4) Vigorous exercise in rabbits breathing air at sea-level approximately, slightly increased the saturation of the arterial blood with oxygen.

(5) The amount of oxygen in solution in the blood is probably of more importance than the degree of saturation of the hæmoglobin with oxygen, under conditions of bodily stress.

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PROCEEDINGS OF THE ROYAL COMMISSION ON NATIONAL HEALTH INSURANCE.*

(Continued from p. 891.)

EVIDENCE OF THE NATIONAL INSURANCE BENEFICENT SOCIETY.

(Q. 8814–8822.) Evidence was given by the joint secretaries, Mr. Canter and Mr. Rockliff, on behalf of this society, which is neither an Approved Society nor a statutory body, but a corporate body acting under licence from the Board of Trade. It has a dual capacity, acting partly as a medium through which various Approved Societies arrange for "additional (treatment) benefits"—mainly dental and optical treatment—and partly as a charity receiving contributions from various institutes and from individual members of trade unions and other bodies by means of collecting boxes.

(Q. 8907–8.) In respect of its unincorporate side, a full account is rendered to each contracting society, but on the incorporate side no such account is rendered,

because we were legally advised we were not authorised to deal with moneys contributed to a charitable fund in that way. But it is open to [an officer of] any society which is a contributor to our funds to come and ascertain for himself exactly how far its subscriptions to the incorporate body have been spent for the advantage of the persons recommended by the society.

Extent of the Operations of the N.I.B.S.

(Q. 8891–2, 8921–3, 8978.) The total income of the N.I.B.S. for 1923 was about £60,000, equally divided between the two sections of its operations. The society does not act for the large industrial societies, and the total membership of the various societies who make use of its machinery is upwards of 1,000,000.

Arrangements with Dentists.

(App. XVIII., 10–31; Q. 8837.) The number of dentists with whom arrangements have been made by this society were summarised in answer to a question, as follows:—

Originally in 1921 we entered into contracts with 1500 surgeon dentists. Then we entered into an arrangement with the Incorporated Dental Society, which society included the best of the non-qualified men. Then later on, after the 1921 Act, we entered into arrangements with members of the Public Dental Service Association, which consists very largely of 1921 men. The total number would be 1500 originally qualified men, 1200 Incorporated Dental Society men, and probably 3000 or 4000 Public Dental Service Association men.

The scale of fees first proposed was lower than that arrived at later as a compromise following a dispute with the British Dental Association.

(Q. 8985–8.) Whether because the dentists under the original contract have not appreciated the fact of the later scale, or for some other reason, the fact appears to be that they have not, to a very large extent, gone up to the agreed maximum scale, with the result that the better qualified men are getting the lower fee. This was described by a member of the Commission as a sort of Alice-in-Wonderland scheme. Actual particulars of the scale were not given.

Cost of a National Scheme.

The witnesses were of opinion that a 100 per cent. service would cost approximately 6*s.* 6*d.* per head per annum, but they considered it questionable whether a capitation system of payment could be arranged.

(Q. 8828.) The capitation fee for medical service is based solely on the service of the medical man himself; but, as regards dental benefit, you have got the mechanic who is involved, you have got the provision of materials for the making-up of goods, quite apart from the services of the dentist himself, and those various factors, in our judgment, would make it difficult to arrange a capitation service with the profession.

The N.I.B.S. has issued approximately 35,000 dental letters. Many thousands of these have not progressed beyond the estimate stage. The experience of one society showed that where a grant of 50 per cent. was reduced to one of 25 per cent., the percentage of uncompleted cases rose from 24 per cent. to 57 per cent.

(App. XVIII., 16.) It is fair to assume therefore that in any national (or other) scheme of dental benefit not based on a full grant, the number of applicants who would be deprived of the benefit for financial reasons would be somewhere about 50 per cent.

Advocacy of Dental Clinics.

(App. XVIII., 22–24.) This society recommends the setting up of clinics in industrial areas, manned by whole-time dentists, both in the interests of efficiency and cost, but—

unless clinics were of an attractive character and care were taken as regards the staffing and the manner in which treatment was given, clinics would soon come to be regarded as Poor-law Institutions and fail of their purpose.

The N.I.B.S. has provided a dental clinic (Q. 9006) Attached to it are two dental surgeons, an anæsthetist, and a nurse. One of the advantages claimed is that no unnecessary work or needless extraction is performed.

* In previous articles the proceedings of the Commission were reported under the following headings: Introductory Note; The Scope of the Insurance Scheme (see THE LANCET, Jan. 31st, pp. 247–8); The Provision of Medical Benefit (Feb. 7th, pp. 301–3; Feb. 14th, pp. 355–6; Feb. 21st, pp. 403–5); Financial Provisions of the Act (Feb. 28th, pp. 454–7); Medical Certification and the Regional Medical Staff (March 7th, pp. 508–9); The Approved Societies and the Money Benefits (March 14th, pp. 564–5; March 21st, pp. 623–4); Evidence of the Hearts of Oak Society (March 28th, pp. 677–9); Evidence of the National Conference of Industrial Assurance Approved Societies and of the Manchester Unity Approved Society (April 4th, pp. 731–3); Evidence of Independent Order of Rechabites, of Rational Association Friendly Society, and of Miners' Societies (April 11th, pp. 784–6; April 18th, p. 839); Evidence of Mr. Alban Gordon (April 18th, pp. 839–40); Evidence of Joint Committee of Approved Societies, of Stock Exchange and Lloyds' Health Insurance Societies, and of Group of Catholic Approved Societies (April 25th, pp. 889–91).

References to the paragraphs in the printed statements issued as appendices to the reports of the oral evidence are given thus: "App. X. 69," and references to the oral evidence thus—Q. 1369.

A Proposed Machiavellian Scheme.

(App. XVIII., 25. Q. 9041.) The witnesses suggested what was described by a member of the Commission as a rather Machiavellian scheme as likely to be advocated by the dental profession—namely, the exclusion from any national scheme at the present time of the provision of dentures.

Approved societies would then be faced with a toothless membership, liable to all sorts of further ill-health through want of the means of masticating food. The profession believe that this state of things would then almost immediately result in an agitation for a complete service, and that the end they have in view would thus be speedily obtained by taking two steps instead of one. There is ground for believing that neither the insured nor their societies would be content to accept this truncated form of a National Dental Service.

Medical Certificates for Dental Treatment Useless.

(App. XVIII., 29, 30.) Medical certificates for dental work appear to these witnesses to serve no other purpose than to transfer any fee up to 5*s.* from the pocket of the needy recipient of the benefit to the pocket of the doctor giving the certificate. In the thousands of cases where this formality has been required at the request of societies, the N.I.B.S. is unaware of any single case in which a certificate has not been forthcoming.

Optical Treatment.

(App. XVIII., 32–70.) The arrangements for this benefit made with the National Association of Opticians include the payment of a fee of 5*s.* for each person sent to an optician for examination and, where glasses are supplied, the price of the glasses. Spectacles in steel frames cost approximately 10*s.* 6*d.*, but usually something better is required.

The evidence suggests that a claim had been put forward by the medical profession that all insured persons receiving optical benefit should be first examined by an ophthalmic surgeon, or by some medical man, panel or other, who claims to possess knowledge and experience as regards diseases of the eye.

It is said, in support of the medical contention, that 5 per cent. of all persons requiring glasses are suffering from a disease of the eye which would pass undetected by an optician, however qualified as an optician he might be. . . In reality, therefore, the claim of the medical profession is that the whole 100 per cent. of claimants for optical benefit should be compelled, in the first instance, to see a doctor, in order that the 5 per cent. amongst them who possess diseases of the eye, not ordinarily patent to an optician, might be ascertained and properly advised or treated.

For examining each person it was understood that the medical profession proposed that a fee of one guinea should be charged.

(Q. 9120.) How is anybody to know whether it is one of the 5 per cent. or one of the 95 per cent. ?—I agree that is the difficulty, but we endeavour to get over that difficulty at a reasonable fee through the medium of our clinic.

An Optical Clinic.

(App. XVIII., 53–7.) The clinic to which reference is made is established in London with a West End ophthalmic surgeon in charge. He is remunerated on a basis which enables one guinea to be distributed over three patients. He is limited to 12 patients per session of two hours. If the surgeon feels that he would like to see patients more than once, no extra charge is made in respect of such additional attendance.

(Q. 9141.) A member of the Commission observed in the form of a question that he was associated with a clinic run under municipal auspices and conducted by one of the best-known ophthalmic surgeons in the West of Scotland at an average cost of 3*s.* 4*d.*

(Q. 9121–47.) With regard to the guinea fee contemplated by the medical profession, the witnesses said that although this might be worth while in the individual case in view of the 5 per cent. chance of serious disease, the proper course in a scheme of a national character would be to establish clinics of the kind which this society had already done. As regards examinations by opticians, they said :

We have attempted outside of the clinic, as I pointed out, to see that it does not pay an optician to proceed with the case if he has the slightest doubt in connexion with it. He gets his money whether he supplies the glasses or not; he gets exactly the same fee ; and therefore it does help to secure that the patient, if there is the slightest doubt of any disease of the eye, is referred to a competent ophthalmic surgeon.

Nursing.

(App. XVIII., 71–92.) Nursing as an additional benefit under the National Health Insurance Acts is described in this evidence as a comparative failure, mainly because contributions are already paid to nursing associations by the industrial section of the community, and they therefore see no reason for bringing their Approved Society into the matter, and also because of the fact that where continuous nursing is desirable it is provided in hospitals and other institutions to which the patient is removed, and the accommodation available to the industrial population in their homes practically prohibits resident nursing.

From the experience of the past three years no society could justify the payment of a capitation fee for nursing in respect of the whole of its membership.

Hospital Treatment.

(App. XVIII., 93–8. Q. 9173–7.) The N.I.B.S. in 1921 took the initiative in getting into touch with the British Hospitals Association with a view to securing in-patient treatment for insured persons, and, in the result, a joint committee formed of representatives of Approved Societies and of members of the Executive of the British Hospitals Association was set up. The arrangements made by societies with the hospitals are of two kinds. Under one arrangement a definite sum is paid per week of in-patient treatment. In other cases the sum set aside by the society is divided amongst the hospitals each quarter in proportion to the number of members of the society treated in the institution during the quarter.

It was agreed that the payments made by the society should not prohibit the hospital from claiming a further payment from a patient in a position to afford it. The witnesses recommended that out-patient treatment for insured persons should be included as an additional benefit in view of the fact that many insured persons are sent to the hospital by the panel doctor. As regards finding the money, they suggested that—

The relief which panel practitioners obtain by transferring insured persons to the out-patient wards of hospitals would seem to entitle the latter to some consideration in the distribution of the money provided for medical benefit under the Insurance Act.

Massage and Electrical Treatment.

(App. XVIII., 106. Q. 9193–5.) The witnesses thought that these should be added to the list of additional benefits, and said that there was a frequent and increasing number of recommendations by panel doctors for these forms of treatment.

I have listened within the last two or three weeks to the figures given by one of the surgeons of St. Thomas's Hospital as to the extraordinary number of cases where massage treatment and radiant heat treatment have been provided by that institution not only to those who have been inmates of the institution, but also to out-patients. It really opened my eyes as to the extent to which these services are at present medically recommended and medically provided.

It was suggested that the provision of X ray photographs, blood tests, &c., should also be included in the additional benefits which might be given under the National Health Insurance Acts.

LONDON INTER-COLLEGIATE SCHOLARSHIPS BOARD. The Board announces that six medical entrance scholarships and exhibitions of an aggregate total value of £513, tenable in the Faculty of Medical Sciences of University College, and in the Medical Schools of University College Hospital, the London Hospital, and the London (Royal Free Hospital) School of Medicine for Women, will be offered. The examination will commence on June 30th next. Full particulars and entry forms may be obtained from the secretary of the Board, Mr. S. C. Ranner, the Medical School, King's College Hospital, Denmark Hill, London, S.E. 5.

MENTAL HOSPITAL ADMINISTRATION.

AN IMPORTANT CONFERENCE.

As briefly noted in our last issue a conference, convened by the Chairman of the Board of Control, was held in London at the offices of the Civil Service Commission on April 21st and 22nd for the purpose of considering: (1) the recommendations of the Departmental Committee's report on nursing in county and borough mental hospitals, and (2) the provision of further accommodation in mental hospitals.

The conference was opened by Mr. Neville Chamberlain, Minister of Health, who paid a tribute to the devotion shown by mental nurses in their difficult work, and emphasised the progress which has been achieved in the position and training of the nurses to-day. He reminded the conference of the work instigated by the Medico-Psychological Association in encouraging training and in examining mental nurses, and of the fact that over 17,000 nurses had obtained the Medico-Psychological Certificate in nursing during the last 30 years. The Minister referred to the Mental Treatment Bill for which he himself had been responsible, and to the disappearance of this Bill owing to the General Election of 1923. He led the conference to hope that after the Royal Commission now sitting had issued its report the Government would find means to promote legislation based upon that report.

NURSING SERVICE IN MENTAL HOSPITALS.

The discussion revealed considerable divergence of opinion on several of the recommendations contained in the report of the Departmental Committee, the principal aims of which were at times somewhat overlooked in the consideration of the effect of its details upon local interests. The questions involved are so important to the future and progress of mental nursing that recapitulation of some of the recommendations as set out in the report will not be out of place.

Aims of the Departmental Committee's Report.

In effect the report aims at the standardisation and unification of the nursing service on a national basis and bringing mental nursing into line with general nursing, of which it is an important branch.

A scheme for grading hospitals is put forward with a view to ensuring the development of really efficient training schools at those hospitals whose size, number of admissions, and general facilities offered sufficient scope and material for providing the training which the Departmental Committee regarded as fundamental to the future of the mental nursing service. The recommendations put forward—viz., the appointment of teachers or sister tutors, the adoption of nursing homes, lecture-rooms, &c., and the affiliation of mental and general hospitals, all have this end in view, and the question of reciprocity between mental hospitals is a necessary counterpart of the scheme. Such reciprocity would of necessity entail some sacrifice on the part of the smallest hospitals, but taking a long view it was thought that this would be more than compensated by the output of more and better trained nurses.

Another and important point is that it is only the prospect of a sound training and of a career that will attract applicants of the right educational standard, and, further, the encouragement of training in general as well as mental nursing is the only way to obtain a controlling staff of such integrity and reliability that the public may have complete confidence in regard to the proper care and treatment of mental patients.

The report recognises a distinction between the requirements of the nursing of actual physical and mental disease and the care of the chronic insane and generally healthy patients, and it is suggested that untrained attendants or orderlies could, if required, be employed for the latter. The Committee held that there were often both men and women educationally unfitted to take a nursing certificate who were notwithstanding specially gifted for this work, and that the supervision of the latter class by the trained nurses would present the best guarantee for the care and kindly treatment of the chronic insane.

The Committee took the view that the initial pay offered to probationers was a matter of less moment than the training and prospects in view, but strongly held that there was need for far greater difference than existed between the pay of trained and untrained nurses. A purely relative scale of pay is drawn up to illustrate this and is constructed to correspond with the rise in the pay of general hospital nurses.

Discussion at the Conference.

Dr. M. A. Collins (Bexley), who spoke on the question of remuneration, considered the pay suggested in the report to be inadequate. No doubt this is true as regards the type of nurse whose primary object in taking up the work is not the acquirement of a certificate.

Dr. W. F. Menzies (Cheddleton), in advocating that training should be compulsory, said that mental nurses must be made to feel that they are engaged for, and are getting, a training, and be taught to appreciate what this means for them. He deprecated the practice of having permanent night nurses, and thought that all nurses should take night duty in rotation and as part of their experience. He agreed with the report in advocating the introduction of general trained nurses into mental hospitals.

The conference seemed in favour of providing facilities for mental nurses to obtain a general hospital training. Miss Musson (formerly matron of Birmingham General Hospital) spoke in favour of reciprocity, but insisted on the necessity of mental nurses taking the full course, denying that their training with the limited bedside experience afforded could ever enable them to enter as second-year nurses. No one opposed the suggestion that after a period of probation nurses should be required to enter into a contract, such as applies in general hospitals.

On the important question of the hours of duty, the Report of the Departmental Committee shows a realisation of the varied difficulties involved, and the recommendations made are notably elastic. The conference provided no answer to the severe indictment made in the report against the two-day shift system. Dr. G. Clarke, who spoke in favour of this system, could only say that he did not believe these alleged defects really existed, and in maintaining that with efficient, well-trained nurses this system of dual control and divided responsibility worked satisfactorily, he seemed to ignore the fact that the average nurse of to-day is not of a high educational standard, and is not certificated. Dr. R. Eager (Devon) spoke against the double-day shift, and agreed with the finding of the report that for actual nursing of mentally and physically ill patients the undivided observation, control, and responsibility of the single turn of day duty was more satisfactory both from the point of view of the patient and of the administration of the ward. All will probably agree that the hours of actual and close attendance on very acute cases of mental disease should be curtailed to the utmost possible, and that the atmosphere of an acute mental ward requires regulations framed with the most liberal consideration for the nursing staff.

Dr. Henry Devine (Portsmouth), in speaking on the questions of obtaining suitable candidates and conditions of service, referred to the nursing of mental patients in other countries. He considered that mental institutions should, so far as possible, resemble our modern garden cities, and that those who had the care of the insane should be encouraged to introduce the methods and influences of ordinary life and occupation. He pointed to the fact that, apart from the acute forms of mental disorder, the great majority of patients now under certificate were in good physical health and did not require nursing so much as the

companionship and control of persons of a sympathetic personality, chosen for general efficiency in normal associations. He personally thought, somewhat paradoxically, that to improve the mental nurse she must be abolished, and he believed that the general sources of trained nurses could, as abroad, provide mental hospitals with efficient nurses for the treatment of those patients in the hospital really requiring nursing. He suggested that this plan would become practicable if mental hospitals and the present Poor-law infirmaries came under one central committee of the local authority.

The nursing of male patients by women nurses was strongly advocated both by Prof. G. M. Robertson (Edinburgh) and by Miss Perry (matron of Cardiff City Mental Hospital), and the favourable experience of this practice all over Scotland and at Cardiff was placed before the conference. Attention was drawn to the comment in the Departmental Committee's Report that few of those superintendents who were opposed to this practice had ever tried it. On the other hand, in England the great difficulty at present is to obtain female nurses, whereas there is a steady supply of male nurses of a good type.

FURTHER MENTAL HOSPITAL ACCOMMODATION.

On the second day of the conference Alderman J. T. Travis-Clegg (Lancashire) and Mr. M. J. Godwin-King (Hellingly) spoke in regard to the extended use of Poor-law accommodation, and upon the greater use of Sections 55, 57, and 79 of the Lunacy Act, 1890, which deal with sending patients on trial, boarding-out, and discharge to care of relatives. Opinions were expressed against sending mental cases to Poor-law infirmaries and the workhouse observation wards, and the conference clearly deprecated the hardship of the system which prefaced the treatment of mental disorder by pauperisation. The advantages of placing Poor-law infirmaries and mental hospitals under one local authority, and the care of senile dementia without certification were considered.

Admission Hospitals and Convalescent Homes.

In opening the discussion on the provision of admission hospitals and convalescent homes, Dr. G. F. Barham (Claybury) referred to the feeling against the enlargement of existing mental hospitals, and to the views held by some against treating early cases at all at mental hospitals. In view of the large number of cases requiring treatment annually, beyond the scope of any possible provision of clinics, public or private, he held the opinion that properly isolated admission units on the villa system should be regarded as essential at every mental hospital, and that such units offered advantages not obtainable at small clinics. He referred to the schemes for linking up the mental hospitals with general hospitals and schools of medicine in different areas, and believed that thereby the reproach that psychiatry was out of touch with general medicine would be removed. Such provision and such schemes he regarded as essential to the development of mental hospitals, both as centres of treatment, for coöperation in research, and as training schools for mental nurses, and he reminded the conference of the important public service which the mental hospital had to perform, and with what benefit to the large population of these hospitals such an organisation would react. Linked up as a unit of a large medical organisation, he thought that there need be no fear of enlarging existing hospitals by providing admission units, and thereby erecting some of the new accommodation which the Chairman had told the conference was required.

Dr. Edwin Goodall (Cardiff) spoke against the treatment of early cases of mental disorder at mental hospitals. He believed that the prevention of insanity, research, and efficient treatment would never progress elsewhere than at psychiatric clinics attached to general hospitals and schools of medicine. He did not explain, however, how the scattered local requirements of the country, far distant from teaching centres, were to be met, nor how such organisation as he proposed was to cope with the great majority of cases.

Agreement was general as to the need for psychiatric clinics, which it is hoped will tend to diminish the number of cases requiring certification and treatment at mental hospitals. But it would appear that among the majority of experts this opinion in no sense carries with it a desire to impair the highest possible standard of humane and efficient treatment of certified cases—and of many voluntary boarders also, and it is widely held that the tendency to ignore and shut out the mental hospitals in any scheme for developing psychiatric medicine will certainly reduce that standard.

PARIS.

(FROM OUR OWN CORRESPONDENT.)

Surgeons' Fees in the Public Hospitals.

A RECENT incident has focused attention on a state of affairs which has gradually become perplexing and serious. The incident concerned a well-known surgeon attached to one of the most important hospitals. He saw in his own consulting-room a young woman to whom he recommended hospital treatment. She entered the hospital and paid the surgeon a fee, for which transaction he was blamed and the matter ended with his resignation from the hospital staff. There is, of course, much to be said on both sides in such a case, but its importance depends less on its individual merits than on its general significance. It is a local symptom of a constitutional disease. What is probably the crux of the matter is the lack of hospital provision for the middle classes—the people who can pay a moderate fee. At present they have often to choose between hospitals originally intended for the indigent and nursing homes whose charges are high. If we add that the surgeons attached to the public hospitals enjoy a high reputation, while some of the surgeons connected with private nursing homes are not exactly illustrious, it will perhaps be patent why many persons of moderate means find their way into the public hospitals. It is easy to call this state of affairs scandalous, but it is difficult to say who is responsible. There is a movement, which has its enemies as well as its friends, in favour of introducing a hospital tariff, according to which the patient of moderate means would be able to enjoy the benefits of first-class surgery in a public hospital at a charge within his reach. But what is to be the attitude of the first-class surgeon in these circumstances? Shall we see him becoming a full-time official, paid a salary by the hospital and disqualified from charging a fee in or outside the hospital?

The Students' "Strike."

The recent students' "strike," which began in the Faculty of Law of the University of Paris, is now happily ended, much to the credit of the University authorities and to the discredit of those who have been tempted to infuse party politics into the academic field. The origin of the trouble is past history now. The students held that the Government's choice of a lecturer in public international law was based less on the candidate's academic qualifications than on his political views, and they protested to the extent of boycotting the newly-appointed lecturer. Other faculties, including that of medicine, showed their sympathy with their fellow-students of the law, and a general strike throughout the student world of France was urged. The Minister of Public Health then took a serious step in suspending the Dean of the Faculty of Law, Prof. Barthélémy, from his office. It is impossible to say how this strike would have ended had not M. Herriot's Govern-

ment fallen. Its fall, as far as the strike was concerned, may be regarded as singularly opportune. The new Government has not felt under any obligation to uphold the rulings of its predecessor in this matter, and it has made amends to the University for having interfered with the traditions of its independence. Prof. Barthélémy has been reinstated, and the students found guilty of rioting have been given an official pardon.

Interstitial Injection of Uriage Water.

On the basis that the water of Uriage (Isère) is isotonic with the blood serum, Dr. Larat advocates hypodermic injections of this water in its natural state, containing all its electrical properties, concurrently with other modes of administration. Interstitial injections of this water offer the three following advantages: (1) The ions which it contains carry electrical charges into the tissues; (2) the water has no hæmolytic action on the red blood corpuscles owing to the complete isotony which exists between it and the blood; and (3) the water introduces nascent colloidal sulphur directly into the tissues. The patients on whom this method was tried were suffering from various forms of eczemas, mainly chronic, or chronic rheumatism. 10 c.cm. of water are injected intravenously or subcutaneously every day until the symptoms definitely disappear.

SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Rate-Aided Patients as Voluntary Boarders in Mental Hospitals.

IN a recent note on mental hospitals[1] mention was made of the difficulty encountered by the administrators of such institutions when dealing with indigent patients willing to enter the hospital as voluntary boarders. The Scottish Lunacy Act does not prohibit the reception of rate-aided voluntary boarders in mental institutions, but under existing arrangements the local authorities do not receive the lunacy grant for such persons unless they are "pauper lunatics." The parish councils are therefore naturally reluctant to make arrangements for admission to mental hospitals without certification. The board of directors of the Crichton Royal Institution, Dumfries, has taken a forward step in this matter by presenting a memorial to the Secretary for Scotland, praying for a modification of the Scottish regulations in regard to rate-aided cases along the lines of Lord Onslow's Mental Treatment Bill, which was introduced in the House of Lords in 1923, but which, through force of circumstances, was allowed to drop. The memorial puts forward statistics to show the difference between the outlook for voluntary and for certified patients. The recovery-rate at the Crichton Royal Institution of those admitted at their own request exceeds that of the rate-aided certified patients by 9·2 per cent. The memorial considers that a 10–15 per cent. improvement in the results of the mental treatment of rate-aided patients would be a conservative estimate of the benefit which would follow the facilitation of their entry as voluntary boarders. It also points out that the double stigmata of "pauper" and "lunatic" which must be incurred before a poor patient comes under competent mental treatment naturally causes postponement to the last possible moment. The increasing popularity of the voluntary system in this country is one of the most encouraging features of mental work during the last 20 years, and is rightly recognised by all concerned as a most important factor in the public health. The changes in English legislation which are expected to follow the report of the Royal Commission will almost certainly include a movement in this direction. Meanwhile all medical men will wish to support the attempt to secure the removal of a serious defect in the legal position in Scotland with regard to the poorer mental patient.

[1] THE LANCET, April 11th, p. 788.

Diphtheria Prophylaxis in Edinburgh.

The preliminary observations of Dr. M. T. Benson, assistant M.O.H. of Edinburgh, regarding diphtheria prevention are distinctly encouraging. Recently he delivered a lecture, under the auspices of the Leith Parents' Association, giving his results in that work during the past year. The method described was that of inoculating children with a special "toxin-antitoxin" preparation. Three hypodermic injections were given at weekly intervals. In the vast majority of cases this is said to confer immunity for about six years, but the degree of immunity is not at its maximum until six months after the course of inoculations. In Leith Academy some 430 children, from 1 to 11 years of age, were dealt with in January and May of last year. Dr. Benson now reports, 14 months later, that of this group only one child has had diphtheria, and that a very mild attack. Furthermore, it had been noted in the case of this child that after the three toxin-antitoxin injections she had not been completely immunised, and a fourth protective injection had been given. She must therefore be regarded as a very highly susceptible case. In the same school some 120 children under 11 years of age had not been treated, and among these there were five cases of diphtheria reported during the same period, three of them being severe. Thus had the incidence of diphtheria been equally heavy in the two groups (treated and untreated cases), then with 5 cases occurring in the untreated group of 120 children one should have expected 18 cases in the much larger group of 430 treated children. Instead of 18 they had only one very mild case.

As a preliminary to the course of inoculations, the Schick test was carried out. Some 4500 children had the Schick test applied, and of these 65 per cent. between 5 and 10 years of age were found to be susceptible to diphtheria. Of those children between 1 and 5 years of age who were tested, 80 per cent. gave positive reactions. This is the dangerous age for diphtheria, 60 per cent. of the deaths in Edinburgh from that disease occurring in children under 5 years. The toxin-antitoxin inoculations given during this period should therefore be of special value. Fortunately, too, the younger the child the less reaction there is, though in no case has Dr. Benson seen a protective injection followed by severe or permanent ill-effects.

Leith Parents' Association.

In the diphtheria prevention campaign carried out in the past year in Leith great assistance has been given to the medical officer of health by a body known as the Leith Parents' Association. Membership of this Association is confined to parents and guardians of children attending Leith Academy, and the aims in view are "to enable parents to keep in touch with the educational affairs of the Academy and to stimulate interest in the wider aspects of education generally." The Association, which was founded in 1920, appoints "parent representatives" on the School Committee, and throughout the winter holds a series of lectures and social evenings. At present it has 190 members. This Association made it easy last year for Dr. William Robertson, M.O.H., to address the parents collectively on advisability of a campaign against diphtheria. His suggestions had all the more appeal, as a serious outbreak of diphtheria in the school in May, 1923, had affected between 30 and 40 children. The Schick test and toxin-antitoxin inoculation were explained, and, as a direct result, the parents of about four-fifths of the children agreed to allow them to be inoculated. The existence of similar associations in all schools could hardly fail to be a powerful adjuvant to public health administration in the country.

Obituary.

ARTHUR JOSEPH EAGLETON, M.D. LOND., M.R.C.P. LOND.,

BACTERIOLOGIST TO THE NEWARK EYE AND EAR HOSPITAL, NEWARK, U.S.A.

THE many friends of Dr. Arthur Joseph Eagleton will regret to hear of his death recently at Newark, U.S.A., at the early age of 34.

Dr. Eagleton went from Rugby to Guy's Hospital, and graduated M.B., B.S. Lond. in 1913. He became pathological assistant to the surgical registrar in 1913 and was awarded the Golding Bird gold medal for bacteriology. While holding a house appointment at Guy's in August, 1914, he volunteered on the first day of the war and received a commission a few days later, when he went to France. He became bacteriologist to the Third General Hospital, B.E.F., and was also in the Fifteenth Field Ambulance. Later he became a specialist in cerebro-spinal fever in one area of England, publishing an article on the occurrence of meningococci in the air of army huts. After the war he gained the M.D. Lond. (in 1918), and he took charge of the bacteriological department of the Wellcome Physiological Research Laboratories, where he remained until 1923, when, finding it necessary to avoid the winter in England, he went as bacteriologist to the Newark Eye and Ear Hospital. Prior to his departure he had been secretary to the Pathological Section of the Royal Society of Medicine. He published several papers giving the results of his careful investigations into methods of standardisation of tuberculin, on the Schick test and active immunisation against diphtheria, and into the virulence of diphtheria bacilli. His work, particularly in connexion with the standardisation of tuberculin and the virulence of diphtheria bacilli, had already placed him amongst the most promising of the younger group of pathologists. In America he had commenced a lengthy series of well-planned observations and experiments on the diagnosis and treatment of ophthalmic tuberculous conditions and on protein sensitisation, and had carried the investigation far despite the handicap of considerable ill-health. His premature death deprives pathology of a keen worker of careful judgment who promised to make further contributions of great value to bacteriology.

His unselfish kindliness, sincerity, and his high personal ideals gained him the affectionate regard of his colleagues and of those who worked under him. He will be missed by a large circle of friends.

CHARLES ALFRED RAYNE, M.D. LOND.

BY the death of Charles Alfred Rayne, at his residence in Lancaster on April 17th, at the age of 79, the borough of Lancaster loses its oldest medical practitioner. He studied at University College, London, qualified as M.R.C.S. in 1873, and in the same year took the M.B. of London University with honours in all examinations, and the M.D. in 1887. Before settling in Lancaster over forty years ago he had a varied experience as demonstrator of pathology in the University of Oxford, as an assistant physician of the Children's Hospital, Manchester, and resident physician at the Radcliffe Infirmary, Oxford. For 32 years he was honorary medical officer of the Royal Infirmary, Lancaster, and later honorary consulting physician. As early as 1875 he contributed a paper to THE LANCET on Animal Heat in its Relation to Temperature Alterations in Certain Injuries and Diseases of the Nervous System, and in 1876 a paper on the Influence of Hydrate of Chloral in Certain Forms of Convulsive Disorders, and again in 1889 a paper entitled What is Life? In THE LANCET, 1903, he described a treatment of goitre by the use of distilled or rain-water.

Public Health Services.

HEALTH OF THE CITY OF LONDON.

THE resident population of the City of London is so small—viz., 13,300 (to be compared with a day population of over 364,000)—that the statistics fluctuate much from year to year. Births during 1924 numbered 94, deaths 151, and deaths of infants 11, equivalent, respectively, to rates of 7·1, 11·3, and 117. In his report for this year Dr. William J. Howarth deals with many interesting subjects.

The decreasing number of dwellings suffer in their sanitary environment from the obstructive effect of the increasing number of high business premises and warehouses. The workers wish to live near their work, but suitable sites cannot be found for them within the City boundaries. Accommodation is needed for the housing of some 1500 persons, mostly living in houses unfit for human habitation. As a beginning a site has been purchased in Shepherdess-walk, Shoreditch, which will house about 500 persons. It is estimated that this first instalment will cost about £95,000 and will involve a charge of about one-ninth of a penny on the City rates for 60 years. The Sanitary Committee recommend that no Government contribution be applied for, but that the whole cost be borne by the City.

A system of voluntary registration of barbers' shops was begun in 1904. At one time there were 32 such establishments on the register; the number is now reduced to five, as most of them have been transferred to the Statutory Register, provided under the L.C.C. Acts of 1915 and 1920. Dr. Howarth points out that the amount of deposit falling in the City from atmospheric pollution in the month of July only was 53·6 tons. He says "the cost of electricity is still far too great for its general use," but that he "believes the substitution of gas for coal and coke in restaurants and business premises is practicable and might be more generally adopted if the gas companies encouraged its greater use" by arranging a special rate for such premises. During excavations in Farringdon-street a considerable quantity of human remains was found at a deep level, possibly indicating the site of an old burial ground for St. Bride's parish. Out of 39 samples of milk tested for tubercle five (or 12·8 per cent.) gave a positive result. The precautions taken in milk sampling to obtain a fair sample without contaminating the milk are described.

As usual, Dr. Howarth devotes much space to the questions concerned with the meat-supply. During the year caseous lymphadenitis, a condition simulating tuberculosis, was found to be unduly prevalent among sheep carcasses received from Argentina. The total number of carcasses found to be affected during the first nine months of the year was 88, not a large proportion, as Dr. Howarth points out, among the 70,000 tons of carcasses received. The lesions were chiefly located in the prescapular (51) and precrural (25) lymph glands, indicating the generalisation of the disease. This disease is not uncommon in Australia, but fewer cases were found among Australian carcasses, owing to the system adopted at the time of slaughter, of careful palpation of the lymph glands in the prescapular, precrural, and superficial inguinal regions. Consignments of chilled beef have been received from Canada. This meat is carried at only 2° or 3° below freezing-point and remains unfrozen. It does not require preliminary thawing or exude juice on cutting, and a period of only 12 or 13 days elapses between slaughter and sale in the market. The meat was in excellent condition, but the carcasses might have been of primer quality. It is stated, however, that a loss was sustained on this attempt to establish a Canadian chilled meat trade, and that it is more profitable to send the live animals to Birkenhead. The Netherlands Government have recently issued an order prohibiting

the importation of meat from countries which have no national system of meat inspection, and arrangements are being made through the Ministry of Health to comply with these regulations as far as the abattoirs at Aldgate and Islington are concerned. At the invitation of the Netherlands Government, a deputation from the City Corporation visited Holland in April, 1924, to observe the methods of meat inspection adopted there. As a means of determining the frequency of antenatal tuberculous infection in calves, a careful record is being kept of the location of tuberculous lesions in calves under the age of 5 months, and it is hoped in future to be able to classify the cases in three sections—viz., (*a*) those obviously postnatal; (*b*) those probably antenatal; and (*c*) those doubtful in origin. An analysis of the organs affected in the case of 79 cows, all under the age of 9, showed that in 23—i.e., 29·1 per cent.—the udder was affected.

In accordance with the recommendation of the Departmental Committee on meat inspection, the unequalled educational opportunities afforded by Smithfield Market are to be used systematically for the training of meat inspectors. Trial lectures have already been held, with a very good attendance. No charge will be made for the lectures. The quantity of meat passing through Smithfields in 1924 was the highest ever known—480,520 tons. Of this amount 21·8 per cent. was British and Irish, 46·8 per cent. from Argentina, 18·9 per cent. from New Zealand and Australia, and 12 per cent. from Holland and other sources. British meat still shows the lack of systematic meat inspection in the country. "The quality, grading, and dressing of Australian beef were, with exceptions, still far from being in the same class as Argentine beef." Many of the quarters of Australian beef were from aged cattle and many of the carcasses of mutton were those of old ewes, no doubt retained for their wool value. New Zealand mutton and lamb maintained its reputation, but the beef was a negligible quantity, generally from old cows and very badly dressed. Holland takes pride of place for depositing in Smithfield the right type of pig carcass, with a long back and loin and short plump legs, from a pig which arrives quickly at the desired weight. Intending British pig-breeders are advised to take this type as a model. The Court of Common Council lodged a protest with the Ministry of Health against the proposals contained in the Factories Bill of 1924, which would have transferred some of the existing powers of control from the sanitary authorities to the factory inspectors.

Rat repression has received attention, but Dr. Howarth lays stress on the weak part of the Act, by which the responsibility for necessary structural alterations is not thrown on the owner and also the difficulty arising from multiple occupancy. Reference is made to the method of locating the body of a dead rat by releasing blue-bottles in the room and watching where they settle. Unfortunately, the trouble in the City with dead rats usually arises in the winter time, says Dr. Howarth, when blue-bottles are not procurable. Another method, available when there is a ceiling below, is to look for a patch of discoloration. Notwithstanding the unsatisfactory state of the law, the various measures of rat repression adopted appear to have prevented an increase in the rat population of the City.

INFECTIOUS DISEASE IN ENGLAND AND WALES DURING THE WEEK ENDED APRIL 18TH, 1925.

Notifications.—The following cases of infectious disease were notified during the week, namely:—Small-pox, 135; scarlet fever, 1543; diphtheria, 845; enteric fever, 36; pneumonia, 1344; puerperal fever, 74; cerebro-spinal fever, 14; acute poliomyelitis, 2; acute polio-encephalitis, 1; encephalitis lethargica, 52; continued fever, 1; dysentery, 3; ophthalmia neonatorum, 129. There were no cases of cholera, plague, or typhus fever notified during the week. The number of small-pox cases showed a decrease of 14 from the number for the preceding week.

Deaths.—In the aggregate of great towns, including London, there were 3 deaths from enteric fever, 134 from measles, 13 from scarlet fever, 114 from whooping-cough, 27 from diphtheria, and 162 from influenza, as compared with 221, 242, 281, and 304 in the four preceding weeks. In London itself the deaths from influenza numbered 16, from whooping-cough 30, and from diphtheria 8.

The Services.

ROYAL NAVAL MEDICAL SERVICE.

Surg. Lt. T. N. D'Arcy to be Surg. Lt.-Comdr.

ROYAL NAVAL VOLUNTEER RESERVE.

Proby. Surg. Sub-Lts. to be Surg. Sub.-Lts.: C. M. Brooks, M. J. Arnott, and D. R. F. Bertram.

ROYAL ARMY MEDICAL CORPS.

Lt.-Col. E. E. Parkes, half-pay list, late R.A.M.C., is restd. to the estabt.

RESERVE OF OFFICERS.

Maj. A. E. Thorp, having attained the age limit of liability to recall, ceases to belong to the Res. of Off.

TERRITORIAL ARMY.

Lt.-Cols. C. I. Ellis and E. C. Montgomery-Smith (from R.A.M.C., T.A.) to be Cols.

Capts. R. J. Bruce (late R.A.M.C.) and R. J. W. A. Cushing (late R.A.M.C., T.A.) to be Capts.

Lt. A. Pain to be Capt. J. O. Moffat to be Lt.

TERRITORIAL ARMY RESERVE OF OFFICERS.

Maj. J. A. Morris (late R.A.M.C., T.A.) to be Maj.

ROYAL AIR FORCE.

Flight Lt. F. E. Johnson is granted a permanent commission in the rank stated.

Flight Lt. R. H. Wace relinquishes his temporary commission on ceasing to be employed.

INDIAN MEDICAL SERVICE.

Capts. E. Calvert, R. Sweet, F. Phelan, Nawin Chand Kapur, Narayan Krishna Bal, and Haji Sulaiman Gulamhossein Haji to be Majs.

Temp. Lts. Jagdish Sahai, Har Sarup Gupta, and Piyare Lal Burman to be Temp. Capts.

Satya Raju Chittoory to be Temp. Lt.

The King has approved the retirement of Col. F. Wall, and Lt.-Cols. E. C. C. Maunsell and F. D. S. Fayrer.

Lt. Birendra Nath Hajra relinquishes his temp. commission.

Homi Edulji Variava and Muthu Ramkrishna Grandhi are granted the rank of Capt. on relinquishing their temp. commissions.

DEATHS IN THE SERVICES.

Surgeon Vice-Admiral Sir Arthur William May, who died on April 21st, in his seventy-first year, at his residence in Cornwall, was a late Director-General of the Medical Department of the Royal Navy. The son of the Rev. H. T. May, Fellow of New College, Oxford, he was educated at Sherborne School and at King's College Hospital and, after qualifying in 1878, entered the Royal Naval Medical Service as surgeon. He was on active service in the Egyptian War of 1882 and was awarded the medal and Khedive's bronze star. He also took part in the Suakim Expedition two years later, and with the Nile Expedition for the relief of General Gordon. For services under Sir Charles Beresford for the relief of Sir Charles Wilson he was mentioned in despatches, having distinguished himself in ministering to the wounded under fire. On his return home he was appointed surgeon of the R.M.L.I. at Portsmouth and subsequently served in Australia; in the cruiser *Volage*, in the training squadron; at the Naval Hospital, Gibraltar; at Devonport; and in the battleship *Empress of India*. From 1901 to 1904 he was P.M.O. of the training ship *Britannia* at Dartmouth, and later took charge of the hospital at Gibraltar. Having reached the rank of Deputy Inspector-General, he was appointed Deputy Inspector of the Medical Department at the Admiralty in 1905, and after holding charge of the Royal Naval Hospitals, first at Portsmouth and afterwards at Chatham, he succeeded Sir James Porter in 1913 as Director-General, retiring in 1917. After the war he became closely associated with the Comrades of the Great War Association and with the British Legion, of which he was national vice-president. Sir Arthur May, who was Hon. Physician to the King, a deputy lieutenant and a magistrate for Cornwall, was awarded the C.B. in 1911 and promoted to K.C.B. in 1914. He was also a Knight of Grace of St. John of Jerusalem and held the Belgian Order of Leopold and the Japanese Order of the Sacred Treasure of the first class. He married, in 1892, Adelaide, a daughter of William Baldock, of Cooling Castle, Kent.

Correspondence.

"Audi alteram partem."

APPENDICITIS AND THE APPENDIX STUMP.

To the Editor of THE LANCET.

SIR,—The correspondence which followed Mr. Rendle Short's excellent clinical lectures on appendicitis (THE LANCET, Jan. 31st and Feb. 7th) dealt mainly with diagnosis and post-operative treatment of the disease, and a point in operative technique passed unchallenged. Mr. Rendle Short states that "the stump of the appendix must be securely buried or otherwise shut off from the peritoneal cavity. It is useless to trust to drainage to make good any deficiencies in this direction." But, in two of the most recent text-books of the day these paragraphs occur: "It is not always wise to attempt invagination of the stump owing to the danger of disturbing adhesions, and it is sometimes impossible if the inflammatory changes have rendered the tissues of the cæcum very friable"; again, "attempts to accomplish invagination of the stump in face of difficulties had better not be persisted in too long as they may result in the loss of valuable time and unduly prolong the operation" (Taylor); and finally, "in general suppurative peritonitis from perforative appendicitis or from rupture of a circumscribed abscess into the free peritoneal cavity I proceed as follows: Open the abdomen as in a case of primary appendicitis, locate and amputate the appendix to prevent further leakage. All manipulation of the intestine should be avoided" (Murphy).

In the most acute types of the disease, therefore, simple ligation and amputation of the appendix is not only recognised as a safe procedure, but some surgeons consider it the method of choice. The question then arises as to whether invagination of the stump is ever necessary. A debate on this matter was opened by Mr. de Martel at the Society of Surgery in Paris in December, 1921. At the end of three months' discussion no unanimity was reached, for each side massed their thousand cases in support of their views.

The "non-buriers" of the stump hold that an abscess not infrequently forms in the wall of the cæcum due to the enclosure of the stump in a closed cavity, or from actual perforation of the cæcal wall by the loops of the invaginating suture. Mr. de Martel stated that his experiments on the cadaver showed that the perforating point in the cæcum was not possible to avoid even by the most adroit surgeons. The mildest result of this may be a localised abscess in the abdominal wall. A perusal of this discussion makes clear that invagination of the stump is an unnecessary manœuvre, that simple ligation with adequate disinfection is quite sufficient. Even the "buriers" admitted that rigorous disinfection made invagination unnecessary and that the simpler method was preferable to inefficient burying of the stump. In America Shelton Horsley has advocated this method for many years, and in his work on "Operative Surgery" there is an instructive illustration showing the fate of the encapsulated invaginated stump compared with that treated by simple ligation.

In England recently Mr. Patterson, in his interesting presidential lecture on the Lure of the New, asks whether certain methods of technique may not be simplified without loss of efficiency. In appendicectomy he states that in acute cases he simply ligatures the appendix and cuts it off to gain precious time, while in the chronic he considers invagination of the stump quite unnecessary from the point of view of safety, though it is neat and may diminish the risk of adhesions.

For over 20 years we invaginated appendix stumps, but for the last five years we have used this simpler method in every type of appendicitis—from the chronic interval case to the gangrenous type with generalised peritonitis. Simple in the extreme, for often two ligatures suffice, one through the mesoappendix, the other round the base of the appendix, this method has never given us any anxiety, no fistula has resulted, nor any post-operative complication. The occasional pricking of vessels in the cæcal wall with the formation of the troublesome hæmatoma sometimes seen is avoided, while the operator is freed from the misdirected efforts of an assistant pushing in an obstinate stump, which sometimes refusing to be easily invaginated seems to ask simpler treatment. The sterilisation, however, must be carefully done by cautery, pure carbolic acid, or iodine, it seems immaterial which agent is used. As all our patients have been private cases we have been obliged to follow their convalescence personally, and we are convinced that this method reduces post-operative flatulence to a minimum; it is, in fact, usually absent, probably because so little manipulation of the cæcum is needed with this technique.

Our experience therefore leads us to think that far from being a deficient method, simple ligation of the appendix with adequate sterilisation of the stump is the method of choice in every type of the disease.

We are, Sir, yours faithfully,

IAN MACDONALD.
Huelva, Spain, April 20th, 1925. W. A. MACKAY.

SCARLATINIFORM RASHES IN INFLUENZA.

To the Editor of THE LANCET.

SIR,—With reference to Dr. Charles Birch's communication concerning cases of influenza masked by scarlatiniform rashes I should like to record the following interesting case.

A patient, a male aged 30, was seen by me during the recent influenza epidemic. He complained of aching pains all over the body and especially in the larger joints. There was intense headache and general malaise. Temperature 102° F. Tongue thickly furred. Influenza was diagnosed. Two days later he developed a blotchy erythematous rash, appearing first on the neck, chest, and upper limbs, spreading to the abdomen and lower limbs later. The rash eventually appeared on the face which, meantime, had been deeply flushed.

The skin over the whole body remained thus affected for three days, when the rash rapidly disappeared, leaving a brownish mottling which cleared at the end of a week. The buccal mucosa was red, swollen, and velvety; the tonsils inflamed. The throat was slightly painful—more so on deglutition. Red papillary patches appeared here and there on a tongue previously thickly coated with white fur.

The diagnosis of influenza was maintained throughout, even though the rash and certain other features of the case suggested otherwise, because I considered the illness differed atypically from scarlet fever in several important respects. There was no exfoliation, and the patient made a speedy and uninterrupted recovery. No case of scarlet fever occurred afterwards, and Dr. Yeoman, M.O.H. for the district, who saw the case and substantiated my findings and diagnosis, informed me that there had been no other cases of scarlatina before or after in the immediate vicinity. The drug treatment precluded any possibility of the rash or symptoms being due to that source.

I am, Sir, yours faithfully,

DONALD M. SUTHERLAND, M.B., Ch.B.
Stokesley, Yorks, April 27th, 1925.

CLIMATOLOGICAL CONGRESS.—From August 17th to 22nd a Climatological Congress will be held in Davos, Switzerland, arranged by the local Research Institute. The subject of the Congress will be the Significance of Climate in its Physical, Physiological, and Therapeutical Aspects. Those desirous of contributing papers on any branch of the subject in which they are specially interested, or wishing further particulars concerning the programme and arrangements, are invited to communicate as soon as possible with the Secretary of the Congress, Dr. Vogel-Eysern, Davos-Dorf, Switzerland.

Medical News.

UNIVERSITY OF CAMBRIDGE: *Examination for the Diploma in Public Health.*—The following candidates have now satisfied the examiners in both parts of the examination:

John A. Charles (distinguished in the principles of hygiene, distinguished in the application of sanitary science), Duncan C. de Fonseka, George K. Fulton, Sidney M. Hattersley (Emm), Hugh A. Sandiford, and Arthur J. Smyth (Emm.).

UNIVERSITY OF GLASGOW.—At the graduation ceremony held on April 22nd the following medical degrees were conferred:—

M.D.—James L. Halliday (high commendation), Hector M. Walker (commendation), Hugh C. Davies, Thomas D. Hunter, and Alexander H. Stewart.

M.B., Ch.B.—With honours: Raymond A. Currie, Morton A. Foulis, and James A. Imrie. With commendation: Robert N. Walker, Charles M. Morton, Robert G. Hutchison, Cecil W. Anderson, Robert Ramsay, James M. Stobo, Edna W. Bruce, Peter D. Thomson, Arthur G. M. Murdoch, Robert S. Hynd, and Henry J. Scott.

Malcolm Allan, Bessie R. Barr, John Barr, Michael J. Bastible, Daniel M. Bell, Joseph A. Bell, Norman L. Bennie, Ann K. Black, Alexander D. Boyd, William Brock, Alexander R. Brown, Douglas Brown, Hamilton Brown, David R. Campbell, Alexander Clark, Alexander F. Clark, John S. Clark, Douglas H. Clutterbuck, Edgar Cochrane, James M. Cormack, Elizabeth Coupland, John Craw, James Crawford, Cochrane Cross, James Cunningham, Janet B. Cunningham, Maurice Curran, Eileen M. Deane, Robert C. Deans, Malcolm C. Douglas, George D. Drever, Lucy M. Dron, William W. Ferguson, John W. Ferrie, Alexander J. Finlayson, John D. Finlayson, John Flynn, John C. Forsyth, John M. Forsyth, Charles A. I. Fuge, Elizabeth S. Galbraith, William D. Gillespie, Thomas L. Gordon, Robert G. R. Grieve, James B. Harrower, Robert Harvey, Ellen M. Hegarty, James Hill, George Hutcheson, Thomas Imrie, Robert F. Innes, Dora Karnovski, Donald H. Kinmont, Neil M. Lees, Alexander Leiper, Moses Lurie, Thomas B. M'Aleer, Donald A. P. Macalister, Archibald MacArthur, Ian E. MacArthur, James C. Macarthur, Alexander G. M'Callum, Duncan M'Callum, Neil M'Diarmid, Peter A. M'Dougall, David T. M'Gibbon, Joseph MacGowan, Eneas J. MacIntyre, Neil D. Mackinnon, Alexander MacLachlan, Sydney H. P. M'Lauchlan, Neil M. MacLean, Elizabeth V. MacLeod, Hector A. Macmillan, William M'Millan, Angus S. M'Neish, Thomas S. Meighan, William Meiklejohn, Isomay Mitchell, James Munn, David S. Murray, James A. Murray, Stanley D. S. Park, John Paterson, William Paterson, John Peter, Margaret I. Prangnell, Leslie W. Queich, Hugh C. Reid, Thomas G. Rennie, Andrew Roberts, Guy S. Robertson, Gertrude R. S. G. Smith, Hugh Smith, John Smith, John T. Smith, William H. Smith, William F. Stalker, Gilbert R. Stark, Norah M. Steele, Thomas J. Steven, William R. M. Stevenson, Malcolm Stewart, Thomas F. Strang, Daniel Struthers, John W. Struthers, William Tait, Matilda D. Tennent, David Thomson, James Thomson, Agnes B. T. Warden, John Warren, Alexander W. Watt, James D. Wilson, John Wilson, George M. Wyburn, and James Young.

On April 21st Bellahouston gold medals for eminent merit in theses for the M.D. were awarded to George A. Allan, David Campbell, and Robert D. Gillespie.

UNIVERSITY OF LONDON.—A lecture on the Projection of the Retina in the Brain will be given at Charing Cross Hospital Medical School by Dr. B. Brouwer, professor of neurology in the University of Amsterdam, at 5 P.M. on Friday, May 15th. The lecture will be delivered in English, and Mr. J. Herbert Fisher, senior consulting surgeon, Moorfields Eye Hospital, will take the chair. Four lectures on Chemical Control of Certain Bodily Functions will be given at St. Bartholomew's Hospital Medical College by Dr. H. H. Dale, F.R.S., on May 15th, 19th, 22nd, and 26th, at 5 P.M. At the first lecture the chair will be taken by Sir Holburt Waring. Admission to these lectures is free.

Thomas Smythe Hughes Medical Research Fund.—Applications for grants from this Fund, accompanied by the names and addresses of two references, must be made to the Academic Registrar of the University (from whom further particulars may be obtained) not later than June 15th.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION.—A special course in Infants' Diseases, for medical officers of welfare centres and others, will be given at the Infants Hospital, Vincent-square, Westminster, from May 18th to 30th. Copies of the programme may be obtained from the Secretary of the Fellowship, 1, Wimpole-street, London, W.

The Fellowship will begin a summer session of lectures at the house of the Royal Society of Medicine on Thursday, May 7th, when Sir Henry Gauvain will give a lantern lecture on Heliotherapy in Surgical Tuberculosis at 5.30 P.M.

INDIAN MEDICAL SERVICE DINNER FUND.—The annual dinner of the Indian Medical Service will be held at the Trocadero Restaurant on Wednesday, June 17th, Lieut.-Colonel A. W. Alcock, F.R.S., in the chair. Tickets and all particulars may be obtained from the joint honorary secretary, Colonel J. J. Pratt, I.M.S. (ret.), 18, Nevern Mansions, Warwick-road, London, S.W. 5.

ROYAL COMMISSION ON LUNACY AND MENTAL DISORDER.—The next meetings will be held at 5, Old Palace Yard, Westminster, on May 4th and 5th, beginning at 10.30 A.M. each day.

QUEEN MARY'S (ROEHAMPTON) HOSPITAL.—On Wednesday, May 6th, at 3 P.M., H.M. Queen Mary will open the extension of the hospital at Roehampton House, Roehampton, S.W.

THE Chemists' Exhibition and Empire Drug Trade Mart will be held from Monday, May 4th, to Friday, the 8th, at 11 A.M. to 8 P.M., at Holland Park Hall, Holland Park Avenue, London, W.

ROYAL COMMISSION ON NATIONAL HEALTH INSURANCE.—The twenty-fifth meeting of this Commission was held at the Home Office, Whitehall, on April 23rd, Sir Andrew Duncan in the chair. Evidence was given on behalf of the National Sailors' and Firemen's Union by Mr. Chambers, who dealt with the special arrangements for seamen. The Loyal Order of Ancient Shepherds, represented by Mr. John Grieve, Deputy Chief Shepherd, and Mr. A. J. E. Saunders, General Secretary, were examined on questions of extensions of benefit, pooling of surpluses, organisation of branch societies, &c. The Association of Approved Societies, representing about 150 societies and 1,500,000 members, gave evidence through Mr. J. E. Hilton, Mr. Robert Smith, and Mr. F. A. Goodwin on matters affecting their constituent societies. Thereafter Miss Amy Cameron and Miss Margaret Hamilton were examined on behalf of the Standing Committee of Scottish Insured Women as to a variety of matters affecting women's interests in health insurance. Proof copies of the oral evidence and the relative statements submitted at the meeting of March 26th and April 2nd are now on sale at H.M. Stationery Office (*4s.* 6*d.* and *2s.* 3*d.*).

INTERNATIONAL SOCIETY OF MEDICAL HYDROLOGY. The annual general meeting of this society, attended by the representatives of eight countries, took place in Paris, April 20th–21st. Dr. Gustave Monod (France) was elected President for the year in succession to Dr. Fortescue Fox (England). On the motion of Dr. Van Breemen (Holland), a committee was appointed to report upon the incidence of chronic rheumatic diseases in Northern Europe as shown by official returns in England and Sweden, and upon their treatment by physical methods. The following subjects were discussed in Prof. Carnot's laboratory at the Faculté de Médecine: (1) Insulin Treatment in Relation to Medicinal Waters, introduced by Drs. Chabanier (France), Poulton (England), and Epstein (New York); (2) the Spa Treatment of Rheumatism of Traumatic Origin, introduced by Drs. Schmidt (Czecho-Slovakia) and Vincent Coates (England). Demonstrations and lectures were also given at the Ecole de Médecine and the Collège de France by Dr. Lepape and Prof. Desgres. The society was entertained at a banquet by the Bienvenu français. An invitation was received from Czecho-Slovakia to hold the next annual meeting of the society in that country.

IRISH FREE STATE: TRAVELLING FELLOWSHIPS IN PUBLIC HEALTH.—The conditions of the Travelling Fellowship in Public Health offered by the Rockefeller Foundation have been published. Three Fellowships are offered in anticipation of the appointment of county medical officers of health under the Local Government Act, 1925. The Fellowships are open to any duly qualified medical practitioner of Irish nationality or parentage who holds a registered or a registrable diploma or degree in sanitary science, public health, or State medicine. The Minister for Local Government of Public Health will set up a committee of experts to consider the applications and to select the most suitable candidates for these Fellowships. The selected candidates will be required to submit to medical examination and to give an undertaking to act, if appointed, as county medical officer of health for a period of at least three years at an initial salary, or combined salaries, of not less than £800 per annum inclusive, with an allowance for travelling expenses. Applicants for the Fellowships must furnish particulars of general educational attainments, professional qualifications, and experience in public health work, age, state of health, service in the National Army, knowledge of Irish, and testimonials of character. The candidates who are selected for travelling Fellowships must be prepared to go to America towards Sept. 1st, so as to arrive at the beginning of the academic year. The course of studies will occupy a period of about eight months.

A DINNER in aid of the funds of the Infants Hospital, Vincent-square, will be held at the Guildhall on May 8th, at 7 for 7.30 P.M., Prince Henry presiding.

UNIVERSITY OF BIRMINGHAM.—The Ingleby lectures will be delivered on May 6th and 13th, at 4 P.M., in the Medical Lecture Theatre, Edmund-street Buildings, by Dr. J. G. Emanuel, on Auricular Fibrillation. Members of the medical profession are invited to attend.

INSTITUTE OF PATHOLOGY AND RESEARCH, ST. MARY'S HOSPITAL.—A course of lectures on Pathological Research in its Relation to Medicine has been arranged for the summer session. These lectures are being given in the Lecture Room of the Bacteriological Department of the Institute on Thursday afternoons at 5 P.M. Sir Almroth E. Wright, F.R.S., delivered the first lecture on April 30th on Chemo-therapeutical Agents. Subsequent lectures will be as follows: May 7th, Prof. W. E. Dixon, F.R.S., Cerebro-Spinal Fluid with Special Reference to Pituitary Secretion. May 14th, Mr. A. T. Glenny, B.Sc., the Principles of Immunity as Illustrated by Protective Inoculation against Diphtheria. May 21st, Prof. E. W. Macbride, F.R.S., the Inheritance of Acquired Qualities. May 28th, Dr. W. E. Gye, the Filterable Viruses. June 4th, Sir Arthur Keith, F.R.S., the Structural and Functional Disorders of the Great Bowel. June 11th, Prof. J. Joly, F.R.S., Radiology. June 15th, Dr. R. Robison, F.I.C., the Chemistry of the Calcification of Bone. These lectures are open to all members of the medical profession and to all students in medical schools without fee.

THE LATE DR. J. DON.—James Don, M.D. Aberd., of Newcastle, who died, aged 61, on April 23rd, after a short illness, was honorary senior surgeon to the Newcastle Throat and Ear Hospital and had been connected with that institution for about 30 years. Born in Aberdeen, he graduated M.B., C.M. at the University of his native town in 1888, and obtained the M.D. with honours in 1890. Two years later he went to Newcastle, where he set up in general practice; he was particularly attracted towards throat and ear work, and for the past four years he devoted himself exclusively to that special branch of medicine. Dr. Don took an active interest in medical politics. He was secretary of the North of England branch of the British Medical Association for about ten years, terminating his office last year, and he was at one time chairman of the Newcastle branch. During the war Dr. Don acted as aural surgeon at the Pendower V.A.D. Hospital, and was secretary of Medical War Committee. A member of the Panel Committee, his activities brought him into direct connexion with most doctors in the two northern counties.

PUBLIC HEALTH PROPAGANDA.—The Minister of Health received on April 23rd a deputation from the Society of Medical Officers of Health, introduced by Dr. John Wheatley. The deputation represented that they in their capacity of men of scientific training, in constant touch with the general public, thought that statutory provision should be made for local authorities to carry on health propaganda, and as a next stage a central body should be set up to advise local authorities on the matter. The society thought that in their special position they would be able to give valuable help to such a central body, and that medical officers of health should themselves be included in its membership. The Minister, in reply, said that he fully agreed with the deputation as to the necessity for propaganda on health questions, and he gave his assurance that he proposed to take steps to have the necessary powers conferred on local authorities forthwith. He also agreed that some sort of central body could give valuable assistance; and when the necessary legislation had been passed he would give careful consideration to the question of the proper constitution of such a body and the functions which should be assigned to it.

REPORTING OF MENTAL DEFECT.—Circular 1359, just issued by the Board of Education to local education authorities, deals with Reports on Mentally Defective Children. "In view of the importance of correct diagnosis" (in the words of the circular) a new Form 306M. is introduced to take the place of Schedule F, which the Board require to have completed in certain cases of mentally defective children. The new form does not differ much from the old, except that more details are expected, the suggestion being made that part of the information required may be collected by someone other than the certifying officer. Alternative forms from local authorities who desire to use their own will not be refused, provided the information given is substantially the same. A revised Form 41D., incorporating certain recognised scholastic attainment tests, is also issued, to be filled up by head teachers for the information of the certifying officer. Form 311M. is the form of the medical certificate prescribed by the Board for the purpose of notification of an idiot or an imbecile to the local authority under the Mental Deficiency Act, 1913. Form 312M. is a similar certificate for use when notifying a moral imbecile. These two forms also accompany the circular, which goes on to draw the attention of local authorities to their legal obligations of first referring to the Board all cases—other than idiots, imbeciles, or moral imbeciles (unless they are blind or deaf)—before notifying to the Mental Deficiency Committee. A warning is also sounded that in view of the definition of "moral imbeciles" in Section 1 (*d*) of the Mental Deficiency Act, 1913, it is only in rare and exceptional circumstances that a child of school age could properly be certified as a "moral imbecile." Copies of these forms can be obtained on application to the Board of Education, Medical Branch, 54, Victoria-street, London, S.W. 1.

Parliamentary Intelligence.

NOTES ON CURRENT TOPICS.

THE BUDGET.

PARLIAMENT reassembled after the Easter recess on Tuesday, April 28th. Mr. CHURCHILL, Chancellor of the Exchequer, introduced the Budget in the House of Commons. In the course of his statement he said the total national expenditure for the year 1925–26 was estimated at £799,400,000, being £9·4 millions more than last year's Budget estimate and £3·7 millions more than the actual expenditure of last year. In future they ought to aim at a reduction in expenditure of at least £10,000,000 a year. An increase in the motor vehicle duty of £1,250,000 would carry this duty to £17,500,000. It was proposed that Great Britain should resume its international standard as a gold standard country from the date of the Budget statement. Bank of England and Treasury notes would only be convertible into gold coin at the option of the Bank of England. The country had a gold reserve of £153,000,000. Increases in death duties would be proposed which would yield £10,000,000 in a full year and £4·5 millions the first year. The total yield of new taxes would be £10,230,000 in 1925–26 and over £20,000,000 in 1926–27. The surplus for 1925–26 was thus increased by £10,230,000 to £36,830,000, and a permanent addition to revenue was secured worth £20,000,000 more in 1926. Legislation would be proposed making improvements in the machinery for income-tax appeals by charities in this country.

Contributory Pensions.

It was proposed to inaugurate a new scheme of widows' pensions and old age pensions which would be contributory and cover broadly the 15,000,000 insured persons within the existing health insurance scheme. These 15,000,000 persons with their dependants comprised 30,000,000, or about 70 per cent. of the nation. The contributions would be from employer and workman 4*d.* per week each, and from employer and workwoman 2*d.* a week each. If these contributions had been made by all persons in the health insurance scheme from the age of 16, a self-supporting scheme would afford pensions of 10*s.* a week to widows of insured persons together with certain allowances for children and orphans, and secondly, 10*s.* per week to all insured persons and their wives at the age of 65. The contribution from the State required to bring the scheme into operation at once was capitalised at £750,000,000. Reduction of income-tax was proposed, amounting to 6*d.* in the £ on the standard rate, making the rate 4*s.* in the £ instead of 4*s.* 6*d.*

Earned Incomes.

It was also proposed to increase the relief on earned incomes from a deduction of one-tenth, subject to a maximum deduction of £200, to a deduction of one-sixth, subject to a maximum deduction of £250. It was proposed to regard as earned income investment income of taxpayers whose age was 65 years or more and whose total income did not exceed £500. In the case of married persons this relief will be granted when either spouse was of the age stated.

HOUSE OF COMMONS.

TUESDAY, APRIL 28TH.

Medical Examinations of Pensioners.

Mr. W. C. ROBINSON asked the Minister of Pensions how many medical boards were held in the 12 months ending March 31st, 1925; in how many cases were final awards of life pensions issued; in how many cases were final awards given of final weekly allowances; and what was the average period of same.—Lieut.-Colonel G. F. STANLEY (Parliamentary Secretary to the Ministry of Pensions) replied: During the period referred to 288,000 medical examinations were held by the Ministry. During the same period 48,500 final awards of 20 per cent. assessment and over, and 16,000 final awards of final weekly allowances of an average duration of 104 weeks, were notified.

Medical Diary.

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

MEETINGS OF SECTIONS.

Monday, May 4th.

SOCIAL EVENING: at 8.30 P.M.
At 8.30 P.M., Fellows, Members of Sections, and their friends will be received by the President, Sir StClair Thomson.
At 9.30 P.M., Dr. Robert Hutchison will give an address on Dr. Samuel Johnson and Medicine (illustrated with eighteenth century portraits).
The Library will be open, and various objects of interest will be exhibited. Music, light refreshments, and cigarettes.

Tuesday, May 5th.

ORTHOPÆDICS: at 5.30 P.M. (Cases at 5 P.M.)
Annual General Meeting:
Election of Officers and Council.

Wednesday, May 6th.

SURGERY: at 8.30 P.M.
Annual General Meeting:
Election of Officers and Council.
Informal Discussion on
Acute Obstruction of the Small Intestine.

Thursday, May 7th.

OBSTETRICS AND GYNÆCOLOGY: at 6 P.M.
Annual General Meeting.

Friday, May 8th.

CLINICAL: at 5.30 P.M. (Cases at 5 P.M.)
Annual General Meeting:
Election of Officers and Council for 1925-26.
OPHTHALMOLOGY } at 8.30 P.M. (Cases at 8 P.M.)
COMPARATIVE MEDICINE }
Discussion on
Diseases of the Eyes Common to Man and Animals.
Openers:
Mr. Humphrey Neame: Parenchymatous Keratitis in Animals.
Mr. Henry Gray: Ulcerative Affections of the Cornea, their Complications and Sequelæ.
Mr. A. F. MacCallan and Mr. Herbert Mason: Cataract in Horses with some Reference to Iritis.

ROYAL INSTITUTION, 21, Albemarle-street, W.
TUESDAY, May 5th.—5.15 P.M., Prof. J. Barcroft: Effects of Climate on the Circulation (III.).
FRIDAY.—9 P.M., Dr. H. H. Dale: Circulation of Blood in the Capillary Vessels.

RONTGEN SOCIETY, British Institute of Radiology, 32, Welbeck-street, W.
TUESDAY, May 5th.—8.15 P.M., Mr. C. H. Holbeach, A.M.I.E.E.: Paper on Some further Aspects of the Theory and Operation of Potter-Bucky Diaphragms, and a Note on the Treatment of Coolidge Tubes.

MANCHESTER MEDICAL SOCIETY, University of Manchester.
WEDNESDAY, May 6th.—8 P.M., Dr. A. E. Barclay: Play and a Little Work in Canada and the States.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF PHYSICIANS, Pall Mall East, S.W.
TUESDAY, May 5th.—5 P.M., Dr. E. D. Adrian: The Interpretation of the Electromyogram. (First Oliver-Sharpey Lecture.)
THURSDAY.—5 P.M. (Second Oliver-Sharpey Lecture.)

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
HAMPSTEAD GENERAL HOSPITAL, Haverstock Hill, N.W. Intensive Course in Medicine, Surgery, and the Special Departments from 10.30 to 5.30 P.M. daily (second week, as per syllabus).—QUEEN'S HOSPITAL FOR CHILDREN, Hackney-road, Bethnal Green, E. Special Course in Diseases of Children. Morning and afternoon sessions (second week).—ST. MARK'S HOSPITAL, City-road, E.C. Special Course in Proctology. Lectures, Demonstrations, and Operations each afternoon (second week).

NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC, Queen-square, Bloomsbury, W.C. 1.
POST-GRADUATE COURSE: MAY-JUNE.
CLINICAL LECTURES AND DEMONSTRATIONS.
MONDAY, May 4th.—2 P.M., Out-patient Clinic: Dr. Hinds Howell. 3.30 P.M., Syphilis of the Nervous System: Dr. Adie.
TUESDAY, May 5th.—2 P.M., Out-patient Clinic: Dr. Walshe. 3.30 P.M., Subacute Combined Degeneration and Allied Disorders: Dr. Birley.
THURSDAY, May 7th.—2 P.M., Out-patient Clinic: Dr. Kinnier Wilson. 3.30 P.M., Paths of Intracranial Infection in Otitis Media: Mr. Theodore Just.
FRIDAY, May 8th.—2 P.M., Out-patient Clinic: Dr. Gordon Holmes. 3.30 P.M., Demonstrations of Re-educational Methods in Exercise Room: Mr. Elmquist.
Full particulars on application to
J. G. GREENFIELD, Dean of Medical School.

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.
MONDAY, May 4th.—11 A.M., Surgical Registrar: Surgical Wards. 12 noon, Mr. Simmonds: Applied Anatomy. 2 P.M., Mr. Bishop Harman: Eye Dept.
TUESDAY.—10 A.M., Medical Registrar: Clinical Methods. 12 noon, Dr. Burrell: Chest Cases. 2 P.M., Mr. Sinclair: Surgical Out-patients.
WEDNESDAY.—2 P.M., Dr. Burnford: Medical Wards. 2 P.M., Mr. Tyrrell Gray: Operations. 2.30 P.M., Mr. Donald Armour: Surgical Wards.
THURSDAY.—10 A.M., Dr. Grainger Stewart: Neurological Dept. 11 A.M., Sir Henry Simson: Gynæcological Wards. 12 noon, Dr. Pritchard: Modern Methods in Medicine.
FRIDAY.—12 noon, Surgical Registrar: Surgical Pathology. 2 P.M., Mr. Viasto: Throat, Nose, and Ear Dept. 3 P.M., Dr. Pritchard: Medical Wards.
SATURDAY.—10 A.M., Dr. Saunders: Medical Diseases of Children. 10 A.M., Mr. Banks-Davis: Operations on Throat, Nose, and Ear.
Daily, 10 A.M. to 6 P.M., Saturdays, 10 A.M. to 1 P.M., In-patients, Out-patients, Operations, Special Departments.

UNIVERSITY COLLEGE HOSPITAL.
MONDAY, May 4th.—5.30 P.M., Prof. A. V. Hill: The Physical Environment of the Living Cell.

HOSPITAL FOR SICK CHILDREN, Great Ormond-street, W.C.
THURSDAY, May 7th.—4 P.M., Dr. Cockayne: Some Urinary Disorders in Children.

INSTITUTE OF PATHOLOGY AND RESEARCH, ST. MARY'S HOSPITAL.
THURSDAY, May 7th.—5 P.M., Prof. W. E. Dixon: Cerebro-spinal Fluid with Special Reference to Pituitary Secretion.

LONDON SCHOOL OF DERMATOLOGY, St. John's Hospital, Leicester-square, W.C.
TUESDAY, May 5th.—5 P.M., Dr. Sibley: Electro-Therapeutics.
THURSDAY.—5 P.M., Dr. Barber: Alopecia Areata and Vitiligo.

UNIVERSITY OF LIVERPOOL POST-GRADUATE LECTURES. (At 3.30 P.M.)
TUESDAY, May 5th.—(At the Southern Hospital.) Mr. H. Taylor: Functional Paralyses after Minor Injuries of the Limbs.
WEDNESDAY.—(At the Northern Hospital.) Dr. L. Cunningham: Jaundice.
FRIDAY.—(At the Royal Infirmary.) Dr. John Hay: Raised Blood Pressure.

MANCHESTER ROYAL INFIRMARY.
TUESDAY, May 5th.—4.15 P.M., Dr. W. Fletcher Shaw: Sterility.
FRIDAY.—4.15 P.M., Dr. C. H. Melland and Mr. W. R. Douglas: Demonstration of Cases.

Appointments.

HALL, PERCY, L.R.C.P. Lond., M.R.C.S., has been appointed Honorary Actino-therapist to the Mount Vernon Hospital, Northwood.

HUNT, E. RIVAZ, M.D. Camb., M.R.C.P. Lond., Honorary Physician to the Royal Sussex County Hospital, Brighton.

ROSS-KEYT, F. D., M.B., Ch.B. Aberd., Assistant Medical Officer of Health of Chester.

THORNLEY, EDITH L., M.B., Ch.B. Glasg., Assistant School Medical Officer, West Riding County Council.

Certifying Surgeons under the Factory and Workshop Acts: PRATT, F. Y., M.D. Dub. (Horncastle), TERRY, R. H., L.S.A., L.M.S.S.A. Lond. (Nelson, Glamorgan), DOUGLAS, W. R., M.B., Ch.B. Manch., F.R.C.S. Eng., an additional Medical Referee under the Workmen's Compensation Act, 1906, for Circuit No. 10, for the purpose of dealing with surgical cases of exceptional difficulty arising in those Districts.

Vacancies.

For further information refer to the advertisement columns.

Bath, Royal United Hospital.—Asst. H.S. £120.
Bedford County Hospital.—Asst. H.S. £130.
Birmingham and Midland Homœopathic Hospital and Dispensary.—Res. H.S. £175.
Brighton, Royal Sussex County Hospital.—Hon. Med. Clin. Asst.
Cambridgeshire Tuberculosis Colony.—H.P. at rate of £100.
Carmarthen, Joint Counties Mental Hospital.—Asst. M.O. at rate of £350.
City of London Hospital for Dis. of the Heart, &c., Victoria Park, E.—H.P. at rate of £100.
Coventry and Warwickshire Hospital, Coventry.—Two Hon. Asst. S.'s.
Dreadnought Hospital, Greenwich.—Anæsthetist. 50 guineas.
Durham County Council, Education Dept.—Asst. School Oculist, £600. Also Asst. School M.O. £600,

Eastbourne, Princess Alice Hospital.—Res. H.S. at rate of £175.
Gloucestershire Royal Infirmary and Eye Institution.—Asst. S.
Harefield, Middlesex, County Tuberculosis Sanatorium.—Third Asst. Res. M.O. £400.
Hospital for Epilepsy and Paralysis, Maida Vale, W.—Hon. Asst. P.
Leicester City Education Committee.—Asst. Sch. M.O. £600.
London County Council Mental Hospitals.—Eighth Asst. M.O. £440.
London Homœopathic Hospital, Great Ormond-street, W.C.—Two Anæsthetists. Each £50.
Manchester Royal Infirmary.—Res. Surg. O. £200. Also Surg. Reg. £150.
Metropolitan Hospital, Kingsland-road, N.—Surg. for Diseases of Women.
Mexborough, Montagu Hospital.—Hon. Visiting and Consulting Surgeons.
Middlesex Hospital, W.—P. and Asst. P.
Nottingham General Dispensary.—Res. Surg. £200.
Queen's Hospital for Children, Hackney-road, Bethnal Green, E.—Asst. S.
Richmond, Surrey, Royal Hospital.—Asst. H.S. £100.
Royal Northern Hospital, Holloway, N.—H.S., Joint H.P. and H.S. Each at rate of £70, and Cas. O. at rate of £90. Also P., Dent. Surg., and Asst. Dent. S.
Royal Society of Medicine, 1, Wimpole-street, W.—Secretary. £800.
Ruthin Castle (Duff House), North Wales.—Jun. Res. P. £150.
St. Mary's Hospital for Women and Children, Plaistow, E.—Res. M.O. and Asst. Res. M.O. at rate of £175 and £130 respectively.
Salford Royal Hospital.—Hon. P. and Hon. S.
Sheffield Royal Infirmary.—H.P. £80.
Southampton Free Eye Hospital.—H.S. £150.
Stoke-on-Trent County Borough.—Asst. M.O. £500.
Walthamstow, Wanstead, and Leyton Children's and General Hospital.—Jun. Res. H.S. £100.
West Middlesex Hospital, Isleworth.—Asst. Med. Supt. £200.
Winchester, Hampshire County Council.—Asst. M.O.H. £600.

The Chief Inspector of Factories, Home Office, London, S.W., announces the following vacant appointments: Tunbridge Wells, Kent; and Kidsgrove, Staffs.

Owing to the resignation of Sir Hamilton Ballance, as one of the Medical Referees under the Workmen's Compensation Act, 1906, for the Districts of the Aylsham, Downham Market, East Dereham, Fakenham, Holt, King's Lynn, North Walsham, Norwich, Swaffham, Thetford, and Wymondham County Courts, there is a vacancy for a surgeon to fill the post. Applications should reach the Private Secretary Home Office, not later than May 16th.

Births, Marriages, and Deaths.

BIRTHS.

CONLEY.—On April 24th, at Almora, Stockton-road, West Hartlepool, the wife of Dr. Wallace M. Conley, of a son.
GRIFFITH.—On April 19th, at Brunswick-square, Hove, the wife of John R. Griffith, F.R.C.S., of a daughter.
WHITBY.—On April 26th, the wife of L. E. H. Whitby, M.B., B.Ch., of Cavendish-mansions, West Hampstead, of a son.

MARRIAGES.

CHILD—YORKE.—On April 23rd, at St. Peter's, Slinfold, Stanley Child, M.A., M.B., D.P.H., to Phyllis Braybrooke, second daughter of Mr. C. F. Yorke, of Hall Land, Slinfold.
GIBB—MUIR.—On April 21st, at Cadzow Parish Church, James Gibb, M.A., M.B., Ch.B., Sandfield House Downham Market, Norfolk, to Janie Gilmour ("Robin"), younger daughter of Mr. and Mrs. Robert Muir, Portland Park, Hamilton, Lanarkshire.
HARPER—HARGOOD-ASH.—On April 23rd, at St. Peter's, Cranley-gardens, John Maurice Harper, V.D., M.R.C.S., D.P.H., Grosvenor-place, Bath, to Caroline Mary St. Albyn, eldest daughter of the late Mr. W. C. Hargood-Ash, of Portmore, Weymouth, and Mrs. Hargood-Ash, of Ashton, Park-gardens, Bath.
SMITH—THOMS.—On March 24th, 1925, at St. Andrew's Church, Calcutta, James Ironside Smith, I.C.S., Waltair, Vizagapatam District, Madras, to Amy Macdougall Thoms, M.D., M.R.C.P., late of Broughty Ferry, Dundee.
WAYTE—YOUNG.—On April 25th, at the Parish Church, Croydon, John Woollaston Wayte, M.C., M.B., B.S. Lond., to Dorothy Hay Young, youngest daughter of George Hay Young, of "Lonsdale," Campden-road, South Croydon.

DEATHS.

HAMILTON.—On April 26th, at "Accra," St. Mark's-hill, Surbiton, suddenly, of heart failure, Lieut.-Colonel Hamilton, late R.A.M.C. and R.A.F., M.D., M.R.C.S., L.R.C.P.
MCFARLAND.—On April 23rd, at Leinster-gardens, W., Armar John McFarland, B.A., M.D., D.P.H., aged 59.
MATHESON.—On April 19th, suddenly, at Duntulm, North Berwick, Angus Matheson, M.D.
MAY.—On April 20th, at Tremeer, St. Tudy, Cornwall, Surgeon Vice-Admiral Sir Arthur May, K.C.B., K.H.P., D.L., aged 70.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Notes, Comments, and Abstracts.

THE AUDIOMETER AND ITS APPLICATION TO MEDICAL RESEARCH.

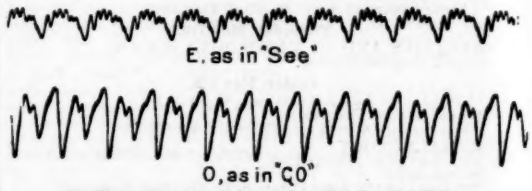
BY C. M. R. BALBI,
ASSOC. M. INST. E.E.

THE term "audiometer" has been recently introduced, as the result of certain new discoveries in aural physics, to define an instrument for the quantitative measurement of hearing. It is believed that the instrument will be of great assistance to the otologist especially in the case of research work on various forms of deafness, as by its means the effect of drugs may be recorded graphically instead of having to rely on the statements made by patients.

The Theory of Audition.

Audiometric measurement involves certain fundamental laws in physics, which must be understood before the audiometer and its method of operation can be explained.

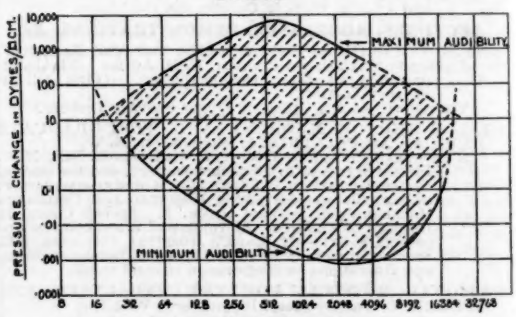
FIG. 1.



Oscillograms of vowel sounds. "O" and "E."

Of first importance are considerations of the character of sound. Sound is said to have (1) frequency; (2) amplitude; and (3) timbre. The term frequency is applied to the fundamental period of any sustained sound. Amplitude may be regarded as the difference in pressure in dynes per sq. cm. between the compressions and rarefactions as they strike tympanum. Timbre refers to the number of overtones or harmonics and their respective amplitudes that are combined in a fundamental. Timbre is of great importance in speech, as by its means characteristic sounds are recognised. The accompanying oscillograms of the sounds "O" and "E" (Fig. 1) illustrate the extent the harmonics preside in the fundamental. In view of the innumerable combination of tones that may be made within the audible range, audiometric measurement would not

FIG. 2.

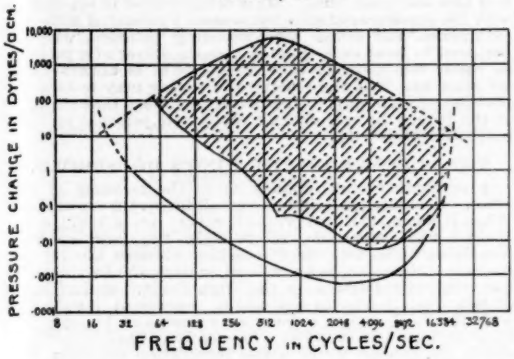


Frequency in Cycles/Sec.
Audition area for the "standard" ear.

have been possible if J. B. J. Fourier (a well-known mathematician) had not proved that all periodic wave forms could be analysed into a fundamental and harmonics of a sinusoidal order. This means that for the purpose of audiometric measurement all sounds may be considered as pure tones of different frequencies and amplitudes, so that a complete analysis may be obtained by taking a relation between amplitude and frequency and omitting the question of timbre, and thereby reducing the complication of the problem to a practical level.

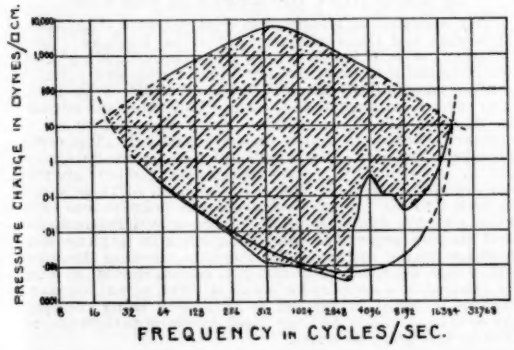
It is known that the human ear is an organ capable of detecting vibrations in the atmosphere, within a frequency spectrum of about 20 to 20,000 cycles per second; outside this region no sound can be heard except that at the lower end

FIG. 3, A.



of the scale the muscles of the ear produce a sensation which is akin to feeling, but which is quite distinct from hearing. It is also known that intensity plays a part in audibility. The lower limit of audibility is well known to us, but there is also an upper limit which, although not so commonly

FIG. 3, B.



met with, is quite distinct. It is a point where the intensity is so great as to produce pain.

Certain American observers, amongst others Dr. H. Fletcher and E. C. Wente, have shown that there is a general relation for "hearing" between amplitude and frequency for a normal ear. By taking a number of normal area for the standard ear, which depicts in graphical form the region of hearing in coördinates of intensity and frequency (see Fig. 2). Any form of deafness must be shown by a diminution of the area set out for the person with normal hearing.

The Apparatus Described.

From the considerations just given it can be seen that an audiometer must consist of an instrument that is capable of producing sound waves of variable frequency and amplitude. It had been found that the most suitable instrument for producing these effects is one in which the source is electrical, and which converts its energy into sound waves by means of a special form of receiver. The electrical source itself may be of any form, such as a Vreeland oscillator or special alternator, but as it is most important that it shall be absolutely free from harmonics at all frequencies and loads, it is found desirable to use a valve oscillator. The control of the two variable factors required calls for careful

FIG. 3, C.

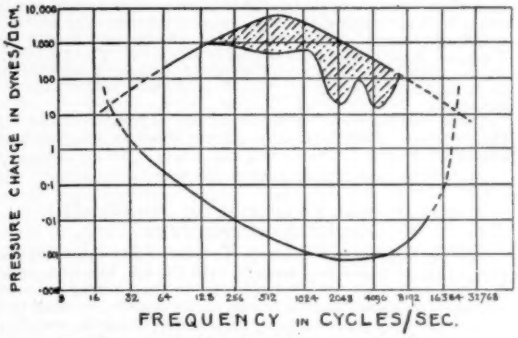
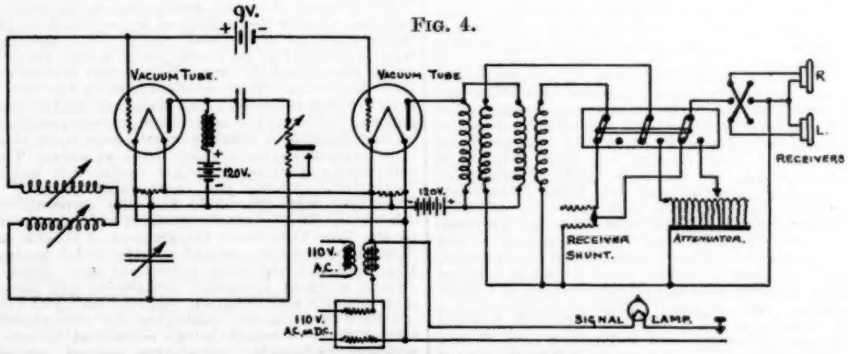


FIG. 3, A, B, C.—Examples of abnormal hearing.

consideration. The control of frequency may be carried out by varying the ratio of a capacity and inductance in a tuned circuit. A set of 16 frequencies covering about eight octaves are found quite sufficient to cover the requirements of any test. The control of intensity may be carried out by varying the input and measuring its degree, or the input may be kept constant and the output varied by means of a resistance or attenuator. The calibration of the instrument somewhat depends on the scales that have been chosen for frequency and intensity. In the audition chart for the standard ear obtained by Dr. Wegel, the scale of both ordinates is made logarithmic.

It is easy to see why this should be so in the case of frequency, as our musical scale is logarithmic; it is found from experience that the intensity scale should also be logarithmic, as this gives the most practical shape to the audition area for the purpose of diagnosis. Frequency can be checked by the simple method of testing the intervals that have been adopted against a set of standard tuning-forks, while in the case of intensity we must either take readings

FIG. 4.



The circuit diagram of an audiometer.

cases by audiometric methods Dr. R. L. Wegel showed for the first time[1] what has now been termed the audition and find their logarithms or employ a direct reading method such as the attenuator. In either case the intensity must bear strict relation to the results obtained for the standard audition area of a normal ear.

A special form of receiver has to be employed in connexion with audiometric measurements. Its function is to convert

[1] The Physical Review, N.S., vol. xix., No. 6, June, 1922. Proceedings of the National Academy of Sciences, vol. viii., No. 7, July, 1922.

the electrical energy produced into sound waves so that the response is proportional to the electrical input at all frequencies; this means that the receiver must be entirely free from resonance. This end may be achieved by special air damping or by the method invented by Mr. J. T. Irwin,[1] in which a special form of electrical damping is employed; this is found to be a much more reliable arrangement.

Method of Testing.

The audiometer is simple in its operation. A complete test may be carried out in about ten minutes, and only minimum audibility is required. Each ear is tested separately and the test is commenced by the patient holding the special receiver to his ears. Absolute silence must be maintained through the test, and all conversation avoided. The patient is provided with a "push button" for controlling a small electric lamp which he is told to operate directly he fails to hear any sound in the receiver after the test has begun. The oscillating circuit is now set to a particular frequency and the intensity varied slowly; the operator watches the patient's signals to determine the critical point and then takes a reading. This process is repeated about every half octave for eight octaves and the results plotted on a chart. A number of these charts are shown in Fig. 3, A, B, C, taken from actual test figures. The accuracy of the apparatus is sufficient to show up any small change in a patient's hearing, so that quantitative results can be obtained.

These results were obtained by an apparatus made by the Western Electric Co., a circuit diagram of which is shown in Fig. 4.

VOCATIONAL TRAINING OF HIGH-GRADE MENTAL DEFECTIVES.

THE problem of the mentally defective child must always present itself under two aspects. On the one hand, there is the case where the structural defect in the central nervous system is so gross that there can be no hope of turning the individual into a competent member of modern society; he can only be protected from the stress of life in some custodial institution for the whole period of his days. On the other hand, there is the higher grade of mental defect where careful guidance and skilled attention during the difficult years of childhood and adolescence may result in the production of a useful member of the community from material which, under less sheltered circumstances, would undoubtedly have turned into the defective or the criminal. This group includes many "borderline" cases of temperamental inadequacy as well as the more typical intellectual inefficiency revealed by "intelligence tests," and it is steadily increasing in size owing to the growth of knowledge as to its diagnosis and treatment. The Besford Court Catholic Mental Welfare Hospital is among the many institutions, originally founded as an asylum for the first class of child, which are now steadily directing their attention towards the selection and salvation of the second class. The seventh annual report of its resident manager is a treatise *in parvo* on mental defect and the name of the institution reveals the nature of the work undertaken. "Mental welfare" is the keynote of the hospital, and only such children are accepted as provide reasonable hope of becoming capable of return to ordinary life between the ages of 16 and 21. No social differentiation is made; cases sent by the mental deficiency and education committees and by the board of guardians are mingled with private cases, and those sent by the Home Office on account of delinquency or inimical home conditions. The spirit is that of a public school, both as regards general education and games. During the last two years an important modification has been put into effect. Whereas originally the hospital was staffed by sisters, whose devotion and zeal produced success where success could hardly have been anticipated by the most confident, yet the importance of masculine influence on growing boys was gradually borne in on those responsible for the institution, so that now it is proposed to divide the home into two departments, a junior for small boys, where the education will be elementary and preponderatingly manual. This will be staffed by the nuns, while the senior department will be under a staff of masters and the training will be a general one culminating in definite vocational classes. The summer camp has been found a most valuable feature of the work; the boys look forward to it with the greatest enthusiasm and return from it in a state of physical fitness which keeps the infirmary almost empty for the rest of the year. It is not a mere holiday camp but a summer school, under canvas, of extraordinary value. The report stresses the mistaken kindness of trying to keep these "misfits" at home in the hope that they will "outgrow" it; when the parents realise that the boy of 15 or 16 is unable to obtain or to keep a job it is too late to do anything for him; had he been placed under suitable care ten years earlier he might have been saved. At Besford Court "a definite stand has been taken against the idea that nothing can be done with the mental defective except feed him and house him." He is being trained in accordance with his specific aptitudes by persons "animated with real enthusiasm and gifted with unending patience, who are prepared to treat each child as does the solver of a problem in chess, remembering that the problem is always being set anew and that the reactions of to-day may restate the problem of yesterday." It is along such lines that the hope of the future for this difficult social and personal problem must indubitably lie.

[1] C. M. R. Balbi: The Damping of Diaphragms in Telephone Apparatus. Experimental Wireless, May, 1924, p. 465.

THE CORONER OF THE KING'S HOUSEHOLD.

A CORRESPONDENT inquires as to the meaning of this office. Coroners' jurisdiction, as all know, is very ancient. When it was modernised (v. the Coroners Act of 1887), a few characteristic archaisms survived in the form of local franchises. The two chief franchise coroners are (1) the coroner of the Admiralty, who is, in fact, the President of the Admiralty Division of the High Court. He has jurisdiction over deaths at sea and a concurrent jurisdiction with the local county coroner over deaths in big ships on arms of the sea or estuaries; in exercising these concurrent duties the coroner under whose jurisdiction the body first comes holds the inquest. (2) The coroner of the King's household is the other important franchise coroner. He holds inquests on bodies lying in the King's palaces or in the curtilage of any house where the King is temporarily resident. The Lord Steward appoints this officer and the jury consists of officers of the household.

A DIRECTORY OF WELFARE CENTRES.

THE Ministry of Health has just reissued the List of Maternity and Child Welfare Centres in England (List 2, M. and C. W. 9, H.M. Stationery Office, pp. 102, price 1*s.* 6*d.*), which contains the addresses of all municipal and voluntary centres known to the Ministry in March, 1925. It is divided into three sections, London, county boroughs, and counties, in the last named the centres being classified under the sanitary districts in which they are situated. The centres are specially marked at which antenatal consultations are given. At about 400 centres special arrangements are made for dental treatment. The chief function of these centres is stated to be "to prevent avoidable sickness and injury among women and children, by means of systematic medical and nursing supervision and instruction in hygiene and a healthy mode of living." Patients needing treatment other than for minor ailments, it is added, should, as a rule, be referred to a doctor or a hospital. The actual number of centres included in the list is 2112, 519 being conducted by county councils, 837 by local sanitary authorities, and 756 by voluntary societies.

IS EVERY CASE OF TYPHOID AN ACCIDENT?

THIS heading, which appeared in the *American City* for March, refers to a recent decision in the American law courts. It appears that the Supreme Court of Illinois has affirmed a judgment of the Appellate Court in favour of the estate of the holder of an accident insurance policy who died of typhoid fever. The said holder died as the result of drinking polluted river water admitted by accident to the drinking water pipes of a railroad shop. Two systems of pipes were connected at only one point, where there was a gate valve which kept the water from either system from flowing into the other. The valve connecting the two systems of water being defective, the drinking water was polluted, and the holder of the accident insurance policy, uninformed of this condition, drank several times from the system of pipes supposed to convey only drinking water. The insurance company contended that his death was not caused by "external, violent, and accidental means" for which indemnity was provided, but the Supreme Court held otherwise. This case, an account of which has been published by the New York State Department of Health in its *Health News*, has, of course, caused a flutter in the insurance world. The *Mutual Underwriter* points out that under these conditions accident insurance companies will have to revise their policies and definitely exclude bacterial diseases from the lists of accidents qualifying for compensation. It is argued that it would be as consistent to sue under an accident policy for pneumonia caused by accidentally catching cold and, indeed, to sue for any other disease not contracted intentionally. According to this line of argument, accident policies will have to become life insurance policies, and this would mean that the premiums for accident policies, so-called, would have to be increased considerably. It will be interesting to see if this judgment in the American courts will affect accident insurance in this country.